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# INTERNATIONAL CRITICAL TABLES
# OF
# NUMERICAL DATA
# PHYSICS, CHEMISTRY AND TECHNOLOGY

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## VOLUME IV

31772

# INTERNATIONAL CRITICAL TABLES
# OF
# NUMERICAL DATA,
# PHYSICS, CHEMISTRY AND TECHNOLOGY

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## ABBREVIATIONS, SYMBOLS, AND CONVENTIONS

The crystal phases (Bodenkörper) are indicated on the central line and apply to all the succeeding values until a new phase is indicated. ? indicates phase not definitely determined. In the composition column, solid state, two values

Les phases cristallines (Bodenkörper) sont indiquées sur la ligne centrale et se rapportent à toutes les valeurs successives, jusqu'à ce qu'une nouvelle phase soit indiquée. ? signifie une phase non déterminée d'une façon définie. Dans

Die Bodenkörper sind längst der Mitte angegeben und beziehen sich auf alle folgende Werte bis zur nächst angegebenen Phase. ? bedeutet, dass die Phase nicht genügend bestimmt ist. In der die Zusammensetzung angebende Colonne für

Le composizioni delle fasi cristalline (corpi di fondo) sono riportate nella linea centrale, e ognuna si riferisce a tutti i valori che seguono fin dove si trova indicata una fase nuova. ? indica una fase non determinata in modo preciso. Nella

separated by a dash indicate that all intervening values are included.

Congruent melting points of molecular compounds are printed in bold-face type.

B. P. Boiling point.
Crit. Critical point.
E Eutectic point.
M Mole.
m Values in the metastable regions.
max. Maximum.
min. Minimum.
Mix. (resp. $Mix_1$, $Mix_2$) Mixed crystals. Where the composition of the mixed crystal is determined it is given in the left-hand composition column. Mix. + liq. indicates coincidence of solidus and liquidus.

M. P. Melting point.
$t_L$ (resp. $t_S$) Temperature at which crystallization begins (resp. ends). All temperatures are $t_L$ unless otherwise noted.
$t_{Tr.}$ Temperature of transition.

$\Delta t°$ Lowering of M. P. of A (resp. B) produced by B (resp. A) in solution.

Trip. Triple point.

U Transformation temperature or incongruent melting point.
Vis. Viscous solutions which solidify to glasses.

Vol. Volume.
Wt. Weight.
% per cent.
↓ A vertical arrow indicates that a linear relation holds over the range so designated.

( ) Values within parentheses are estimated.

la colonne des compositions, état solide, un trait séparant deux valeurs indique que toutes les valeurs qui interviennent sont incluses.

Les points de fusion des combinaisons moléculaires sont imprimés en caractères gras.

B. P. Point d'ébullition.
Crit. Point critique.
E Point eutectique
M Mol. gr.
m Valeurs dans les régions métastables.
max. Maximum.
min. Minimum.
Mix. (resp. $Mix_1$, $Mix_2$) Cristaux mixtes. Lorsque la composition des cristaux mixtes a été déterminée, celle-ci est donnée dans la colonne des compositions à gauche. Mix. + liq. indique la coincidence du solidus avec le liquidus.
M. P. Point de fusion.
$t_L$ (resp. $t_S$) Température à laquelle la cristallisation commence (resp. finit). Toutes les températures sont $t_L$ à moins d'une autre indication.
$t_{Tr.}$ Température de transition.
$\Delta t°$ Abaissement du M. P. de A (resp. de B) produit par l'introduction de B (resp. de A) dans la solution.
Trip. Point triple.

U Température de transformation ou point de fusion incongruent.
Vis. Solutions visqueuses qui se solidifient en donnant des verres.
Vol. Volume.
Wt. Poids.
% Pour cent.
↓ Une flèche verticale indique qu'il existe une relation linéaire dans tout l'intervalle ainsi désigné.
( ) Les valeurs entre parenthèses sont des valeurs estimées.

den festen Zustand, drücken zwei durch einen Strich getrennte Angaben aus, dass alle dazwischen liegenden Werte eingeschlossen sind.

Kongruente Schmelzpunkte molekularer Verbindungen sind durch hervorgehobenen Druck gekennzeichnet.
B. P. Siedepunkt.
Crit. Kritischer Punkt.
E Eutektischer Punkt.
M Mol.
m Werte im metastabilen Gebiet.
max. Maximum.
min. Minimum.
Mix. (bezw. $Mix_1$, $Mix_2$) Mischkristalle. Ist die Zusammensetzung der Mischkristalle bestimmt, so ist dies in der linken Colonne, welche die Zusammensetzung angiebt, verzeichnet. Mix. + liq. zeigt Koinzidenz der festen und flüssigen Phase an.
M. P. Schmelzpunkt.
$t_L$ (bezw. $t_S$) Temperatur bei welcher die Kristallisation beginnt (bezw. endet). Alle Temperaturen sind $t_L$ wenn nichts anderes bemerkt.
$t_{Tr.}$ Umwandlungs - Temperatur.
$\Delta t°$ Schmelzpunktserniedrigung von A (bezw. B) durch B (bezw. A) in der Lösung.

Trip. Tripelpunkt.

U Transformations - Temperatur oder inkongruenter Schmelzpunkt.
Vis. Viskose Lösungen, welche zu Gläsern erstarren.

Vol. Volumen.
Wt. Gewicht.
% Prozente.
↓ Ein vertikaler Pfeil steckt das Gebiet linearer Abhängigkeit ab.

( ) In Klammer gesetzte Werte sind Schätzungen.

colonna delle composizioni dello stato solido, due valori separati da una lineetta, stanno a significare che sono pure compresi tutti i valori intermedi.

I punti di fusione congruenti dei composti molecolari sono stampati in grassetto.

B. P. Punto di ebollizione.
Crit. Punto critico.
E Punto eutettico.
M Grammimolecole.
m Valori nelle regioni metastabili.
max. Massimo.
min. Minimo.
Mix. (risp. $Mix_1$, $Mix_2$) Cristalli misti. Quando si conosce la composizione dei cristalli misti essa è indicata nella colonna delle composizioni a sinistra. Mix + liq. significa coincidenza del solidus e del liquidus.

M. P. Punto di fusione.
$t_L$ (risp. $t_S$) Temperatura alla quale comincia (o finisce) la cristallizzazione. Tutte le temperature sono $t_L$ quando non è indicato diversamente.
$t_{Tr.}$ Temperatura di transizione.
$\Delta t°$ Abbassamento del punto di fusione di A (o B) prodotto da B (o A) in soluzione.

Trip. Punto triplo.

U Temperatura di trasformazione oppure punto di fusione incongruente.
Vis. Soluzioni viscose che solidificano formando vetri.

Vol. Volume.
Wt. Peso.
% Percento.
↓ Una freccia verticale significa che esiste una relazione lineare in tutto l'intervallo così indicato.
( ) I valori fra parentesi sono apprezzati.

# TRIPLE POINTS, TRANSITION POINTS AND MELTING POINTS AT ORDINARY AND LOW PRESSURES[1]

H. W. Foote

## INTRODUCTION

The following triple points are possible: (1) Crystal—liquid—vapor. (2) Crystal—crystal—vapor. (3) Crystal—crystal—liquid. (4) Crystal—crystal—crystal.

The last two types have not been found at pressures below one atmosphere. In general, the temperature at a triple point, when the pressure is less than one atmosphere, coincides within the limits of experimental error with the freezing point or the transition point. For temperature and pressure data for such triple points, the reader should therefore consult the tables of freezing points or transition temperatures (Vol. I, p. 98); and of vapor pressures (of one-component systems, Vol. III, p. 199) respectively. It has, however, been shown by Richards, Carver and Schumb (11) that the freezing point of benzene saturated with air at a pressure of one atmosphere is 0.003° lower than the temperature at the triple point (5.496° and 35.4 mm). The temperature commonly given for the corresponding triple point of water (0.0075°) is based only upon the effect of pressure in defining the freezing point of water, 0°, and takes no account of the effect of dissolved air at atmospheric pressure. If the latter effect (0.0023°) is taken into account in defining the freezing point of water, the temperature of the triple point is +0.0098°C.

## ONE-COMPONENT SYSTEMS

### Melting Points Known with a Probable Accuracy of ±0.05°

For the purpose of this table, the *melting point* is defined as the temperature on the I. C. T. scale (*v.* Vol. I, p. 53), at which the crystalline and liquid phases are in equilibrium with dry air at a pressure of one atmosphere. Richards, Carver and Schumb (11) have shown that dissolved air, at a pressure of one atmosphere, lowers the freezing point of benzene 0.031°, so that the freezing point is lower by this amount than would be the case if the pressure were applied by a piston or an insoluble gas. The standard temperature of the melting point of ice, as usually determined, may also be slightly uncertain depending on the extent to which the water is saturated with air. The lowering in freezing point due to the solubility of the air in this case amounts to about 0.0023°. The melting points of all compounds in the following list were taken in air, but saturation with air was demonstrated only in the case of benzene. As it has been repeatedly shown that saturation of a liquid with air takes place rather rapidly when there is thorough contact between the two, the possible error in melting point from incomplete saturation is probably not greater than the other errors of experiment.

The table gives a list of melting points which appear to be known, with reasonable certainty, within ±0.05°. The list is quite probably incomplete; but where any doubt existed as to the accuracy of a result, it has not been included. For numerous melting points which are probably nearly as good, *see* de Visser (18), Block (3), and especially Timmermans (13, 14, 15, 16).

When more than one reference is given in the table, the melting point adopted is the weighted average of the data to which reference is made. No references are given to data which were not actually used, though nearly every melting point given has been determined repeatedly with considerable accuracy. Except for water, the melting point of benzene is probably the most accurately known.

[1] Except "soaps" for which *v.* final index, and high melting oxides and other refractory substances, for which *v.* p. 83.

| Name | Formula | M. P., °C | Lit. |
|---|---|---|---|
| Acetic acid | $CH_3COOH$ | 16.60 | (4, 17) |
| Acetophenone | $CH_3COC_6H_5$ | 19.655 | (10) |
| Benzene | $C_6H_6$ | 5.493 ±0.01 | (11) |
| α-Bromonaphthalene | $C_{10}H_7Br$ | 6.20 | (7) |
| 1, 2-Dibromomethane | $C_2H_4Br_2$ | 9.99 | (2, 9) |
| Formic acid | HCOOH | 8.39 | (6) |
| Nitrobenzene | $C_6H_5NO_2$ | 5.67 | (12) |
| Sulfuric acid | $H_2SO_4$ | 10.49 | (5) |
| Sulfuric acid (monohydrate) | $H_2SO_4.H_2O$ | 8.62 | (5) |
| Sulfur trioxide | $SO_3$ | 16.83 | (1, 8) |

### LITERATURE

(For key to the periodicals see end of volume)

(1) Berthoud, *42*, **20**: 77; 23. (2) Biron, *7*, **81**: 590; 13. (3) Block, *7*, **82**: 403; 13. (4) Bousfield and Lowry, *4*, **99**: 1432; 11. (5) Brönsted, *7*, **68**: 693; 10. (6) Ewins, *4*, **105**: 350; 14. (7) Jones and Lapworth, *4*, **105**: 1804; 14. (8) Lichty, *1*, **34**: 1440; 12. (9) Moles, *7*, **80**: 531; 12. (10) Morgan and Lammert, *1*, **46**: 881; 24. (11) Richards, Carver and Schumb, *1*, **41**: 2019; 19. (12) Roberts and Bury, *4*, **123**: 2037; 23. (13) Timmermans, *28*, **25**: 300; 11. (14) Timmermans, *28*, **27**: 334; 14. (15) Timmermans, *28*, **30**: 62; 21. (16) Timmermans, Horst and Onnes, *18*, **6**: 180; 23. (17) de Visser, *70*, **12**: 101; 93. (18) de Visser, *70*, **17**: 182; 98.

### Transition Temperatures

For the purpose of these tables, the term *transition temperature* refers to the temperature at which two crystalline forms of a substance are in equilibrium at a pressure of one atmosphere. This temperature coincides, within the limits of experimental error, with the triple point, crystal—crystal—vapor, when the vapor pressure in the latter system does not differ greatly from one atmosphere. In the tables, the transition temperatures given are the weighted averages of values, references to which are given by numbers. No references are given to data which were not used in obtaining the values in the tables. Where the number of determinations is sufficient, the weighted average deviation is given under the heading "±°C." Where this is not significant, a probable accuracy or reliability has been indicated.

Transition temperatures of molecular compounds such as double salts or salts with water of crystallization have, of course, only been included when the compounds behave as one-component systems, *i.e.*, when there is no change in composition of the phases at the transition point.

### A-Table, Non-Metallic Elements

For the metallic elements, *v.* Vol. II, p. 458

| Formula | $t_{Tr.}$, °C | ±, °C | Lit. | Formula | $t_{Tr.}$, °C | ±, °C | Lit. |
|---|---|---|---|---|---|---|---|
| $I_2$ | 47 | * | (73) | $O_2$ | −240 | * | (95) |
| $N_2$ | −237 | >5 | (65) | P | − 77 | <5 | (24) |
| $O_2$ | −225 | >5 | (95) | S | 95.5 | 0.1 | (72, 101) |

* Existence of transition uncertain.

### B-Table, Chemical Compounds

Standard arrangement, *v.* Vol. I, p. 96

(Except oxides of Al, Ba, Fe, Mg, Ra, Ca, Sr, Zr, Si, the rare earths and their combinations with one another, for which *see* p. 83.)

𝔅-Table, Chemical Compounds.—(*Continued*)

| Formula | $t_{Tr.}$, °C | ±, °C | Lit. |
|---|---|---|---|
| $SO_2$ | | | (120.5) |
| $NH_4NO_3$ | −17 | <5 | (7, 126, 133) |
| | 32.2 | 0.2 | (22, 30, 32, 85, 86, 126) |
| | 50.5m | 0.5 | (19.5) |
| | 83.9 | <1 | (22, 32, 126, 140) |
| | 125.3 | 0.2 | (12, 22, 32, 116, 126, 140) |
| $NH_4Cl$ | 184.3 | <1 | (23, 51, 113, 119) |
| $NH_4ClO_4$ | 240 | >5 | (127) |
| $NH_4Br$ | 137.4 | <1 | (114, 118) |
| $NH_4I$ | −17 | <1 | (23, 114) |
| $(NH_4)_3H(SO_4)_2$ | 134 | >5 | (37) |
| $As_2S_2$ | 267 | >5 | (19) |
| $As_2S_3$ | 170 | >5 | (19) |
| $SbCl_3$ | 65 | <5 | (66) |
| | 69.5 | <5 | (66) |
| $Bi_2O_3$ | 704 | <5 | (50) |
| $NH_4CNS$ | 90 | <5 | (21, 46, 129) |
| | 120 | * | (129) |
| For other carbon compounds belonging here, *v.* the ℭ-Table | | | |
| $(C_3H_7NH_3)_2SnCl_6$ | 186 | >5 | (104) |
| $[NH_2(C_2H_5)_2]_2SnCl_6$ | 146 | * | (104) |
| $SiO_2$, *v.* p. 19 | | | |
| PbO | 587 | * | (60) |
| $PbSO_4$ | 854 | 4 | (26, 38, 47, 60, 115) |
| $PbSO_4.2PbO$ | 450 | * | (60) |
| $3Pb_3(PO_4)_2.PbCl_2$, pyromorphite (artificial) | 670 | >5 | (35) |
| $3Pb_3(AsO_4)_2.PbCl_2$, mimetite (artificial) | 395 | >5 | (35) |
| $TlClO_4$ | 226 | >5 | (127) |
| TlI | 173 | <5 | (43, 84) |
| $TlNO_3$ | 75 | 1.8 | (22, 34, 46, 133) |
| | 145 | 1.5 | (22, 33, 34, 46) |
| $TlOC_6H_2(NO_2)_3$, thallium picrate | 46 | <1 | (99) |
| ZnS | 1020 | <5 | (1) |
| $ZnSO_4$ | 740 | >5 | (38) |
| $HgI_2$ | 127.4 | 0.4 | (21, 90, 102, 109, 120, 122) |
| HgS.HCNS | 110 | * | (125) |
| CuBr | 384 | <5 | (27, 54, 84) |
| CuI | 401 | 2 | (54, 84, 98) |
| $Cu_2S$ | 91 | <5 | (97) |
| $Cu_2Se$ | 110 | * | (9) |
| $Cu_2Te$ | 351 | >5 | (29) |
| | 387 | >5 | (29) |
| $Cu_4Te_3$ | 365 | >5 | (29) |
| $AgClO_4$ | 158 | >5 | (127) |
| $AgBrO_3$ | 98.5 | <1 | (100) |
| AgI | 145.8 | 1 | (21, 70, 79, 84, 98, 111, 116, 122, 124) |
| $Ag_2S$ | 177 | <5 | (40, 58, 83, 110) |
| $Ag_2SO_4$ | 411 | <5 | (38, 88) |
| $Ag_2Se$ | 133 | <5 | (8, 9) |
| $AgNO_3$ | 159.6 | 0.1 | (22, 56, 116, 140) |
| $[NH_2(CH_3)_2]_2PtCl_6$ | 10 | * | (75) |
| $[NH_2(iso\text{-}C_3H_7)]_2PtCl_6$ | 32 | <5 | (103, 123) |
| $[NH_2(C_2H_5)_2]_2PtCl_6$ | 144 | * | (104) |
| $[NH(C_2H_5)_2CH_3]_2PtCl_6$ | 62 | * | (104) |
| | 122 | * | (104) |
| $[NH_2(C_3H_7)_2]_2PtCl_6$ | 89 | * | (104) |
| $[NH(C_3H_7)_2C_2H_5]_2PtCl_6$ | 107 | >5 | (103) |
| $[NH(C_3H_7)_3]_2PtCl_6$ | 59 | * | (104) |
| | 142 | * | (104) |
| $[N(C_3H_7)_4]_2PtCl_6$ | 108 | * | (104) |
| | 201 | * | (104) |
| $MnSO_4$ | 860 | >5 | (38) |
| FeS | 298 | >5 | (78) |
| $Fe_2P$ | 80 | * | (76) |
| $Fe_3P$ | 440 | * | (76) |
| $Ni_3S_2$ | 550 | >5 | (18, 39) |
| $CrCl_2.4H_2O$ | 38 | <5 | (69) |
| $PbCrO_4$ | 707 | >5 | (60) |
| | 783 | >5 | (60) |
| $2PbCrO_4.5PbO$ | 744 | * | (60) |
| $PbWO_4$ | 877 | >5 | (60) |
| $3Pb_3(VO_4)_2.PbCl_2$, vanadinite (artificial) | 710 | >5 | (35) |
| $AlBr_3$ | 70 | <5 | (66) |
| $MgF_2.Mg_2P_2O_8$, wagnerite | 845 | >5 | (138) |
| $6MgO.8B_2O_3.MgCl_2$, boracite | 266 | <5 | (52, 81, 116) |
| $CaSO_4$ | 1193 | >5 | (47) |
| $CaCO_3$ | 970 | * | (13) |
| $SrSO_4$ | 1152 | >5 | (47) |
| $SrCO_3$ | 908 | >5 | (16, 108) |
| $BaCl_2$ | 925 | 2 | (42, 71, 96, 109, 112, 128) |
| $Ba(ClO_4)_2$ | 284 | >5 | (127) |
| $BaSO_4$ | 1149 | >5 | (47) |
| $BaCO_3$ | 806 | 5 | (14, 16, 41, 74, 108) |
| $LiClO_3$, *v.* p. 233 | 982 | >5 | (16) |
| $Li_2SO_4$ | 576 | 4 | (57, 87, 88, 129) |
| NaOH | 300 | <5 | (55) |
| $NaClO_4$ | 158 | >5 | (127) |
| $Na_2SO_4$ | 236 | 3 | (15, 25, 57, 61, 63, 67, 87, 88, 129, 139) |
| $Na_2SO_4.NaF$ | 105 | <5 | (139) |
| $Na_4P_2O_7$ | 387 | * | (107) |
| | 520 | * | (107) |
| $Na_2HPO_4.12H_2O$ | 29.6 | <1 | (53) |
| $Na_2CO_3$ | 450 | >5 | (57) |
| $Na_2MoO_4$ | 424 | >5 | (15, 49, 57, 67) |
| | 585 | >5 | (15, 49, 67) |
| | 623 | >5 | (15, 49, 67) |
| $Na_2WO_4$ | 580 | >5 | (15, 68, 93) |
| | 589 | <5 | (15, 68, 93) |
| $Na_3AlF_6$, cryolite | 568 | >5 | (36, 89) |
| $Na_2O.Al_2O_3.2SiO_2$, nephelite | 1150 | >5 | (44) |
| KOH | 248 | <5 | (55) |
| $KClO_3$ | 255 | >5 | (37) |
| $KClO_4$ | 300 | <5 | (127) |
| $K_2S$ | 146.4 | <5 | (21) |
| $K_2SO_4$ | 588 | 5 | (4, 47, 48, 57, 64, 67, 87, 88) |
| $KHSO_4$ | 164.2 | <5 | (23) |
| | 180.5 | <5 | (23) |

* Existence of transition uncertain.

𝔅-Table, Chemical Compounds.—(*Continued*)

| Formula | $t_{Tr.}$, °C | ±, °C | Lit. |
|---|---|---|---|
| $KNO_3$ | 127.8 | 1.1 | (10, 11, 22, 34, 56, 132, 133) |
| | 147 | * | (62) |
| $KPO_3$ | 450 | >5 | (3) |
| $K_4P_2O_7$ | 278 | >5 | (3) |
| $K_2CO_3$ | 410 | >5 | (57) |
| KCNS | 143 | <5 | (21, 46, 129) |
| $K_2SO_4.PbSO_4$ | 544 | >5 | (47) |
| $2KI.CdI_2$ | 215 | >5 | (20) |
| $K_2Ni(C_2S_2O_2)_2$ | 20 | >5 | (105) |
| $K_2CrO_4$ | 666 | <5 | (4, 48) |
| $K_2Cr_2O_7$ | 237 | <5 | (107, 141) |
| $K_2MoO_4$ | 327 | <5 | (67) |
| | 454 | <5 | (67) |
| | 477 | <5 | (4, 67) |
| $K_2WO_4$ | 388 | >5 | (67) |
| | 575 | * | (4) |
| $K_2SO_4.2CaSO_4$ | 937 | >5 | (47, 87) |
| $K_2SO_4.2SrSO_4$ | 775 | >5 | (47) |
| $LiKSO_4$ | 435 | >5 | (88) |
| RbOH | 245 | >5 | (55) |
| $RbClO_4$ | 279 | >5 | (127) |
| $Rb_2SO_4$ | 653 | <5 | (57, 87) |
| $RbNO_3$ | 163.5 | <5 | (22, 116, 133) |
| | 219 | <5 | (116, 133) |
| $Rb_2SO_4.2CaSO_4$ | 787 | >5 | (87) |
| | 915 | >5 | (87) |
| $LiRbSO_4$ | 142 | >5 | (87) |
| CsOH | 223 | <5 | (55) |
| CsCl | 451 | >5 | (142) |
| $CsClO_4$ | 219 | >5 | (127) |
| $Cs_2SO_4$ | 660 | >5 | (87) |
| $CsNO_3$ | 153.5 | <5 | (22, 46, 133) |
| $Cs_2SO_4.2CaSO_4$ | 722 | >5 | (87) |

* Existence of transition uncertain.

### ℭ-Table, the ℭ-Arrangement

Comparatively few transition temperatures of C-compounds are known, and most of them are quite inaccurate or uncertain. From the study of a large number of compounds, Schaeling (*Diss.*, Marburg, 1910) has concluded that polymorphous organic compounds are usually monotropic and that enantiotropy is rare.

For "liquid crystals," *v.* Vol. I, p. 314.

| Formula | Name | $t_{Tr.}$, °C | ±, °C | Lit. |
|---|---|---|---|---|
| $CBr_4$ | Carbon tetrabromide | 46.9 | <1 | (21, 66, 106, 116) |
| $CCl_4$ | Carbon tetrachloride | −45 | >5 | (45) |
| $C_2H_8BrN$ | Ethylamine hydrobromide | 83 | * | (80) |
| $C_2H_8ClN$ | Ethylamine hydrochloride | 80 | * | (80) |
| $C_2Br_2Cl_4$ | Dibromotetrachloroethane | 80 | >5 | (46) |
| | | 109 | >5 | (46) |
| $C_2Cl_6$ | Hexachloroethane | 45 | <5 | (21, 116, 123) |
| | | 71.3 | 0.4 | (21, 94, 116, 123) |
| | | 125 | * | (94) |
| $C_3H_4O_4$ | Malonic acid | 94 | * | (136) |
| $C_4H_{12}ClNO_4$ | Tetramethylammonium perchlorate | 355 | * | (127) |
| $C_6H_4Br_2$ | *p*-Dibromobenzene | 8.5 | * | (6) |
| $C_6H_4Cl_2$ | *p*-Dichlorobenzene | 25 | * | (134) |
| | | 29 | * | (134) |
| $C_6H_8N_2O_3$ | Aniline nitrate | 98 | >5 | (137) |
| $C_7H_7NO$ | α-Benzaldoxime | −28 | * | (6) |
| $C_7H_9N$ | *p*-Toluidine | 22 | * | (6) |
| $C_8H_9NO_2$ | α-Anisaldoxime | 20 | * | (6) |
| $C_8H_9NO_2$ | α′-Anisaldoxime | 13 | * | (6) |
| $C_{10}H_8O$ | α-Naphthol | 49 | * | (6) |
| $C_{10}H_9N$ | α-Naphthylamine | 13.5 | * | (6) |
| $C_{10}H_{13}NO$ | Butyric anilide | 16 | >5 | (5) |
| $C_{10}H_{15}ClO$ | Camphor monochloride | 74 | <5 | (92, 136) |
| $C_{10}H_{16}O$ | Camphor | −32 | >5 | (23, 135) |
| $C_{10}H_{16}O$ | Camphor | 90 | <5 | (23, 135) |
| $C_{13}H_{10}N_4O_5$ | *m*-Dinitrodiphenylcarbamide | 55 | * | (91) |
| | | 180 | * | (91) |
| $C_{14}H_{10}Cl_4$ | 1, 1, 2, 2-Tetrachloro-1, 2-diphenylethane | 100 | * | (77) |
| $C_{14}H_{10}N_2O_2$ | Phthalylphenylhydrazide | 9.4 | <1 | (28) |
| $C_{14}H_{13}NO$ | *o*-Hydroxy-*m*-methylbenzylideneanilide | 34 | >5 | (59) |
| $C_{15}H_{12}N_2O_2$ | Phthalylphenylmethylhydrazide | 55.1 | <1 | (27) |
| $C_{16}H_{18}N_2O_2$ | *p*-Azophenetole | 95.5 | <5 | (17, 31) |
| $C_{20}H_{17}NO_3S$ | α-Naphthylamine naphthalene-α-sulfonate | 66 | † | (131) |
| $C_{20}H_{17}NO_3S$ | α-Naphthylamine naphthalene-β-sulfonate | 54 | † | (131) |
| $C_{27}H_{46}O$ | Cholesterol | 43 | >5 | (82) |

* Existence of transition uncertain.

† This transition temperature undoubtedly exists, but it is uncertain whether the system is of 1 or 2 components.

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# EFFECT OF PRESSURE UPON MELTING AND TRANSITION POINTS; VOLUME CHANGE ON MELTING AND TRANSITION; DIRECTLY MEASURED COMPRESSIBILITY- AND THERMAL EXPANSION-DIFFERENCES

P. W. Bridgman

## INTRODUCTION

*Units.*—Throughout the following tables the pressure unit is the normal atmosphere; the temperature unit, the absolute centigrade degree; and all volume changes, unless otherwise indicated, are expressed in cm³/kg.

*Abbreviations and Conventions.*—The liquid phase is indicated by "L," and solid phases by the Roman numerals I, II, etc. In cases where the observed melting point at one atm. is less than the I. C. T. normal M. P. (*v.* Vol. I), the I. C. T. value is inserted in brackets for comparison.

*Latent Heat.*—The latent heat of any phase change may be calculated from the equation:

$$l\left(\frac{\text{joule}}{\text{kg}}\right) = T\Delta V \frac{dP}{dT} \times 0.10133,$$

where $T$ is the absolute centigrade temperature, $P$ is the pressure in atm. and $\Delta V$ is the accompanying volume change in cm³/kg. This calculation will be facilitated in many cases by reference to the original papers, where tabulated values of $dT/dP$ are given. An approximate method for computing differences of thermal expansion and specific heat for the reacting phases may be found in (8).

## EINLEITUNG

*Einheiten.*—Grundsätzlich ist in den folgenden Tafeln die normale Atmosphäre die Druckeinheit, als Temperatureinheit gelten absolute Centigrade, die Volumänderungen sind (wenn nichts anderes angegeben) in cm³/kg ausgedrückt.

*Abkürzungen und Festlegungen.*—Die flüssige Phase ist durch "L" angezeigt, die festen Phasen durch römische Zahlen (I, II, III, . . . ). In den Fällen, in denen der beobachtete Schmelzpunkt bei einer Atmosphäre niedriger ist, als der Normal-Schmelzpunkt [M. P. (Bd. I)] der I. C. T., so ist dieser letzte Wert zum Vergleich in Klammer daneben gesetzt.

*Latente Wärme.*—Die latente Wärme jeder Phasenänderung ergiebt sich nach der Gleichung:

$$l\left(\frac{\text{joule}}{\text{kg}}\right) = T\Delta V \frac{dP}{dT} \times 0{,}10133,$$

$T$ = absolute Centigrad Temperatur, $P$ = Druck in Atmosphären, $\Delta V$ ist die dabei auftretende Volumänderung in cm³/kg.

Diese Rechnung wird in vielen Fällen durch Heranziehung der in der Literatur sich vorfindenden Werte für $dT/dP$ erleichtert. Eine angenäherte Methode zur Berechnung der Differenz der thermischen Ausdehnungen beziehungsweise der spezifischen Wärme der Phasenänderung ist in (8) zu finden.

## INTRODUCTION

*Unités.*—L'unité de pression utilisée dans les tables suivantes est l'atmosphère normale; l'unité de température, le degré centigrade absolu; et tous les changements de volume sont exprimés en cm³/kg à moins d'une autre indication.

*Abréviations et conventions.*—La phase liquide est indiquée par "L"et les phases solides par les chiffres romains I, II, etc. Lorsque le point de fusion observé sous une atm. est inférieur au Pt. de F. normal des T. C. I. (*v.* Vol. I), la valeur des T. C. I. a été écrite entre parenthèse pour comparaison.

*Chaleur latente.*—La chaleur latente de chaque changement de phase peut être calculée au moyen de l'équation:

$$l\left(\frac{\text{joule}}{\text{kg}}\right) = T\Delta V \frac{dP}{dT} \times 0{,}10133,$$

où $T$ est la température absolue en degrés centigrades, $P$ est la pression en atm. et $\Delta V$ est le changement de volume produit en cm³/kg. Ce calcul sera facilité dans bien des cas si l'on se réfère aux mémoires originaux, où l'on trouvera une table donnant les valeurs de $dT/dP$. On trouvera à (8) une méthode approximative pour le calcul des différences dans le cas de la dilatation thermique et de la chaleur spécifique pour les phases réagissantes.

## INTRODUZIONE

*Unità.*—Nelle tabelle seguenti viene fatto sempre uso dell'atmosfera normale come unità di pressione, e di gradi centigradi assoluti come unità di temperatura. Tutte le variazioni di volume, tranne che non sia diversamente indicato, sono indicate in cm³/kg.

*Abbreviazioni e convenzioni.*—La fase liquida viene indicata con "L" e le fasi solide sono indicate con numeri romani (I, II, ecc.). Nei casi in cui il punto di fusione osservato ad un atmosfera, è più basso del punto normale di fusione [normale M. P. (*v.* Vol. I)], delle I. C. T., quest'ultimo valore, è riportato tra parentesi per confronto.

*Calori latenti.*—I calori latenti dei cambiamenti di fase si possono calcolare dall'equazione:

$$l\left(\frac{\text{joule}}{\text{kg}}\right) = T\Delta V \frac{dP}{dT} \times 0{,}10133,$$

dove $T$ è la temperatura assoluta, $P$ la pressione in atmosfere e $\Delta V$ è la variazione di volume in cm³/kg.

Questi calcoli sono in molti casi facilitati da richiami alla letteratura originale dove si trovano tabelle per i valori $dT/dP$. Un metodo approssimato per calcolare le differenze nel caso della dilatazione termica e dei calori specifici delle fasi reagenti si trova riportato in (8).

## ELEMENTARY SUBSTANCES (*v.* p. 11)

## CHEMICAL COMPOUNDS

### Part I. Melting-Point Data Reproducible by Power Series (*v. also* Part II, p. 11)

M. P. (°C) $= t_0 + a \times 10^{-4}P - b \times 10^{-8}P^2$. Range: up to $P_{max.}$

*Example:* The M. P. of formic acid at 2000 atm. is 7.8 (resp. 8.4) + (132 × $10^{-4}$ × 2000) − (85 × $10^{-8}$ × $(2000)^2$) = 30.8° (resp. 31.4)°C.

| Formula | Name | $t_0$ (obs.) | $t_0$ (I. C. T.) | a | b | $P_{max.}$ | Lit. |
|---|---|---|---|---|---|---|---|
| $H_3PO_4$ | *o*-Phosphoric acid | 38.0 | 42.3 | 0.83 | | 2600 | (29) |
| $PH_4Cl$ | Phosphonium chloride*† | 28 | 26 | 300 | 165 | 3000 | (29) |
| | C-Compounds, the C-Arrangement | | | | | | |
| CHN | Hydrocyanic acid | −13.4 | −14 | 226 | 157 | 3800 | (29) |
| $CH_2O_2$ | Formic acid | 7.8 | 8.4 | 132 | 85 | 3000 | (29) |
| $C_2H_4Br_2$ | Ethylene dibromide† | 9.9 | 10.0 | 260 | 133 | 3000 | (29) |
| $C_3H_4Br_2O_2$ | 1, 2-Dibromopropionic acid | 64.0 | 64 | 201 | | 1000 | (34) |
| | 1, 2-Dibromopropionic acid, metastable | 51.0 | 51 | 191 | | 1300 | |
| $C_4H_6O_2$ | α-Crotonic acid | 71.4 | 72 | 373 | | 300 | (16) |
| $C_4H_8Cl_2S$ | 2, 2-Dichloroethyl sulfide† | 13.9 | 13.5 | 150 | 49 | 2000(?) | (1) |
| $C_4H_{10}O$ | Trimethyl carbinol† | 24.9 | 25.5 | 355 | 397 | 2700 | (29) |
| $C_4H_{10}O_4$ | *dl*-Erythritol | 117.0 | 126 | 83 | 59 | 3000 | (15) |
| $C_5H_{12}O$ | Dimethylethyl carbinol† | − 8.45 | −11.9 | 228 | 278 | 3800 | (29) |
| $C_6H_4Cl_2$ | *p*-Dichlorobenzene | 52.3 | 52.9 | 275 | 134 | 3000 | (6) |
| $C_6H_5NO_3$ | *o*-Nitrophenol | 44.9 | 45 | 240 | | 300 | (16) |
| $C_7H_7Br$ | *p*-Bromotoluene | 26.5 | 28 | 301 | 140 | 3000 | (6) |
| $C_7H_7Cl$ | *p*-Chlorotoluene | 6.9 | 7.8 | 275 | 130 | 3000 | (6) |
| $C_7H_7I$ | *p*-Iodotoluene | 33.9 | 35 | 314 | 147 | 3000 | (6) |
| $C_7H_7NO$ | Formanilide | 46.6 | 47.5 | 209 | 153 | 2900 | (29) |
| $C_7H_7NO_3$ | *p*-Nitroanisole | 52.5 | 54 | 244 | 121 | 3000(?) | (27) |
| $C_7H_8O$ | *p*-Cresol | 33.3 | 33.8 | 236 | 67 | 2900 | (29) |
| $C_7H_8O_2$ | Guaiacol | 28.4 | 28 | 184 | 107 | 3000 | (15) |
| $C_8H_8O$ | Acetophenone | 19.2 | 19.7 | 243 | 162 | 3000 | (29) |
| $C_8H_{10}$ | *p*-Xylene† | 13.2 | 13.2 | 355 | 183 | 2900 | (29) |
| $C_9H_{10}O_2$ | Veratrole | 23.3 | | 224 | 108 | 3000 | (6) |
| $C_{10}H_8$ | Naphthalene† | 79.95 | 80.1 | 376 | 192 | 3500 | (16, 19, 29) |
| $C_{10}H_8O$ | α-Naphthol | 95.8 | 96 | 248 | 65 | 3000 | (22) |
| $C_{10}H_9N$ | α-Naphthylamine | 48.9 | 50 | 200 | | 300 | (16, 23, 26) |
| $C_{10}H_{12}O$ | Anethole | 22.27 | 22.5 | 212 | 94 | 3000 | (6) |
| $C_{10}H_{14}O$ | Thymol | 49.2 | 51.5 | 210 | 197 | 3000 | (6, 16) |
| $C_{10}H_{20}O$ | Menthol, stable | 41.1 | 42.5 | 248 | 192 | 3000 | (6, 16) |
| | Menthol, metastable | 36.5 | 35.5 | 248 | | 300 | (16) |
| $C_{12}H_{24}O_2$ | Lauric acid | 42.5 | 48.0 | 238 | 160 | 3000 | (29) |
| $C_{13}H_{10}O_3$ | Salol (Phenyl salicylate) | 42.0 | 43 | 298 | 139 | 3000 | (15) |
| $C_{13}H_{12}$ | Diphenylmethane | 26.9 | 27 | 264 | 124 | 3000 | (6) |
| $C_{13}H_{13}N$ | Benzylaniline | 35.6 | 37 | 241 | 115 | 3000 | (6) |
| $C_{14}H_{10}O_3$ | Benzoic anhydride | 41.2 | 43 | 267 | 59 | 3000 | (15) |
| $C_{14}H_{14}N_2O_3$ | *p, p'*-Azoxyanisole, liquid crystal transition | 117.3 | 117.4 | 303 | 225 | 3000(?) | (16, 26) |
| | Melting | 135.9 | | 408 | | | (26) |
| $C_{14}H_{28}O_2$ | Myristic acid | 51.8 | 58 | 245 | 171 | 2400 | (29) |
| $C_{16}H_{18}N_2O_3$ | *p*-Azoxyphenetole, liquid crystal transition | 138.5 | 136.9 | 370 | | 300 | (16) |
| | Melting | 168.0 | | 476 | | 300 | (16) |
| $C_{16}H_{32}O_2$ | Palmitic acid | 61.2 | 64 | 211 | 46 | 1800 | (29) |
| $C_{17}H_{12}O_3$ | Betol (β-Naphthyl salicylate) | 93.0 | 95 | 341 | 335 | 3000 | (15) |
| $C_{18}H_{36}O_2$ | Stearic acid | 68.4 | 69.3 | 258 | | 300 | (16) |
| $C_{19}H_{16}$ | Triphenylmethane | 92.8 | 92.5 | 367 | 267 | 3000 | (15) |
| $C_{22}H_{42}O_2$ | Erucic acid | 31.3 | 33.5 | 213 | 107 | 3000 | (29) |
| $C_{34}H_{66}O_2$ | Cholesteryl benzoate, ordinary melting | 178.3 | 178.5 | 760 | | 300 | (16) |

* The triple point vapor—liquid—solid is *ca.* 28° and 46 atm.

† Volume change on melting, $cm^3/kg$:
$PH_4Cl$—870 at the triple point.
$C_2H_4Br_2$—46 at 15°, 41 at 25°, 37 at 35°, 36 at 45°.
$C_4H_8Cl_2S$—54—0.0065*P*.
$C_5H_{12}O$—81.8 at 30°, 70.7 at 40°, 61.4 at 50°, 54.0 at 60°, 46.7 at 70°.
$C_5H_{12}O$—45.5 − 0.0850 ($t$ + 8.5°).
$C_8H_{10}$—190 at 30°, 175 at 50°.
$C_{10}H_8$—145.8 − 0.688 ($t$ − 80.1°). Range, $\Delta t$ = 140°.

## NON-METALLIC ELEMENTARY SUBSTANCES

For metals, *v.* Vol. II, p. 459

**$H_2$**, Hydrogen (36)

**He**, Helium (17.5)

**P**, White phosphorus (7); *cf.* (16, 22, 29); *see* Fig. 1

| *P*, atm. | *t*, °C | $\Delta V$, cm³/kg |
|---|---|---|
| Liquid–I | | |
| 1 | 44.2 | 19.3 |
| 1 000 | 73.8 | 17.9 |
| 2 000 | 101.0 | 16.6 |
| 3 000 | 126.8 | 15.4 |
| 4 000 | 151.3 | 14.2 |
| 5 000 | 174.0 | 13.1 |
| 6 000 | 196.0 | 12.0 |
| I–II | | |
| 6 000 | 0.1 | 8.46 |
| 7 000 | 12.5 | 8.29 |
| 8 000 | 24.5 | 7.92 |
| 9 000 | 36.0 | 7.64 |
| 10 000 | 47.2 | 7.37 |
| 11 000 | 58.0 | 7.10 |
| 12 000 | 68.4 | 6.84 |

**S**, Sulfur (29)

These results are uncertain because of slow internal changes

| *P*, atm. | *t*, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L-monoclinic | | |
| 1 | 114 0 | |
| 180 | 120.0 | 41 |
| 510 | 130 | 40 |
| 860 | 140 | |
| 1240 | 150 | |
| Monoclinic–rhombic | | |
| 1 | 96.7 | |
| 100 | 100 | 13.8 |
| 360 | 110 | 13.9 |
| 610 | 120 | 13.9 |
| 850 | 130 | 14.0 |
| 1090 | 140 | 14.0 |
| 1320 | 150 | |
| Liquid–rhombic | | |
| 1630 | 100 | |
| 2060 | 170 | |
| 2550 | 180 | |
| 3060 | 190 | |

Triple point: 1400 atm., 153.7°C.

## CHEMICAL COMPOUNDS, PART II

Standard arrangement (*v.* Vol. III, p. viii)

The temperatures are melting points unless otherwise indicated.

**$H_2O$**, Water (10); *cf.* (9, 29, 32); *see* Fig. 2

| *P*, atm. | *t*, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–I | | |
| 1 | 0.0 | 90.0 |
| 590 | − 5.0 | 101.6 |
| 1 090 | −10.0 | 112.2 |
| 1 540 | −15.0 | 121.8 |
| 1 910 | −20.0 | 131.3 |
| L–III | | |
| 3 420 | −17.0 | 23.1 |
| 2 820 | −18.5 | 30.1 |
| 2 430 | −20.0 | 37.1 |
| 2 045 | −22.0 | 46.6 |
| L–V | | |
| 6 160 | 0.0 | 52.7 |
| 5 270 | − 5.0 | 60.3 |
| 4 360 | −10.0 | 67.9 |
| 3 680 | −15.0 | 75.4 |
| 3 040 | −20.0 | 82.8 |
| L–VI | | |
| 4 640 | −15.0 | 98.0 |
| 5 110 | −10.0 | 96.0 |
| 5 620 | − 5.0 | 93.8 |
| 6 160 | 0.0 | 91.6 |
| 6 880 | + 5.0 | 88.4 |
| 7 390 | 10.0 | 84.4 |
| 8 040 | 15.0 | 79.8 |
| 8 710 | 20.0 | 75.1 |
| 10 250 | 30.0 | 66.3 |
| 11 990 | 40.0 | 59.0 |
| L–VI | | |
| 13 970 | 50.0 | 52.3 |
| 16 150 | 60.0 | 47.7 |
| 18 530 | 70.0 | |
| 20 960* | 80.0 | |
| I–II | | |
| 2 094 | −35.0 | 217.7 |
| 2 006 | −45.0 | 217.0 |
| 1 916 | −55.0 | 216.2 |
| 1 826 | −65.0 | 215.4 |
| 1 736 | −75.0 | 214.6 |
| I–III | | |
| 2 035 | −20.0 | 177.3 |
| 2 087 | −30.0 | 191.9 |
| 2 108 | −40.0 | 199.2 |
| 2 091 | −50.0 | 202.3 |
| 2 049 | −60.0 | 204.9 |
| II–III | | |
| 3 260 | −25.0 | 14.8 |
| 2 820 | −28.0 | 16.4 |
| 2 450 | −31.0 | 17.9 |
| 2 160 | −34.0 | 20.6 |
| II–V | | |
| 3 460 | −25.0 | 40.1 |
| 3 680 | −28.0 | 40.1 |
| 3 880 | −31.0 | 40.1 |
| 4 070 | −34.0 | 40.1 |

* Extrapolated from 76.4°.

| *P*, atm. | *t*, °C | $\Delta V$, cm³/kg |
|---|---|---|
| III–V | | |
| 3 409 | −20.0 | 54.69 |
| 3 395 | −25.0 | 54.61 |
| 3 383 | −30.0 | 54.54 |
| 3 358 | −35.0 | 54.46 |
| V VI | | |
| 6 176 | 0 0 | 38.86 |
| 6 172 | − 5.0 | 38.66 |
| 6 169 | −10.0 | 38.47 |
| 6 166 | −15.0 | 38.28 |
| 6 162 | −20.0 | 38.09 |

Triple Points and Volume Changes

| *P*, atm. | *t*, °C | Direction of volume change | $\Delta V$, cm³/kg |
|---|---|---|---|
| III–L–I | | | |
| 2 045 | −22.0 | III–L | 46.6 |
| | | L–I | 135.2 |
| | | II–I | 181.8 |
| II–III–I | | | |
| 2 100 | −34.7 | II–III | 21.5 |
| | | III–I | 196.3 |
| | | II–I | 217.8 |
| V–III–L | | | |
| 3 420 | −17.0 | V–III | 54.7 |
| | | III–L | 24.1 |
| | | V–L | 78.8 |
| V–II–III | | | |
| 3 400 | −24.3 | V–II | 40.1 |
| | | II–III | 14.5 |
| | | V–III | 45.6 |
| VI–V–L | | | |
| 6 175 | 0.16 | VI–V | 38.9 |
| | | V–L | 52.7 |
| | | VI–L | 91.6 |
| L–I–vapor | | | |
| 0.00602 | 0.0075 | | |

**$NH_4NO_3$** (12); *cf.* (4, 5, 14, 17, 20, 21, 29); *see* Fig. 3

| *P*, atm. | *t*, °C | $\Delta V$, cm³/kg |
|---|---|---|
| Liquid–I | | |
| 1 | 169.6 | |
| 1 000 | 203 | *ca.* 51 |
| I–II | | |
| 1 | 125.5 | 13.51 |
| 1 000 | 135.0 | 11.66 |
| 2 000 | 143.5 | 10.20 |
| 3 000 | 151.4 | 9.06 |
| 4 000 | 158.7 | 8.17 |
| 5 000 | 165.6 | 7.39 |
| 6 000 | 172.0 | 6.65 |
| 7 000 | 178.0 | 5.94 |
| 8 000 | 183.3 | 5.24 |
| 9 000 | 188.7 | 4.56 |

| *P*, atm. | *t*, °C | $\Delta V$, cm³/kg |
|---|---|---|
| II–III | | |
| 1 | 82.7 | 7.58 |
| 200 | 79.1 | 7.96 |
| 400 | 74.8 | 8.33 |
| 600 | 69.8 | 8.70 |
| 800 | 64.2 | 9 08 |
| II IV | | |
| 1 000 | 65.8 | 12.10 |
| 2 000 | 80.5 | 12.11 |
| 3 000 | 94.8 | 12.12 |
| 4 000 | 108.6 | 12.16 |
| 5 000 | 121.8 | 12.21 |
| 6 000 | 134.6 | 12.30 |
| 7 000 | 147.1 | 12.41 |
| 8 000 | 159.1 | 12.54 |
| 9 000 | 170.8 | 12.70 |
| III–IV | | |
| 1 | 32.0 | 20.26 |
| 200 | 38.7 | 20.52 |
| 400 | 45.9 | 20.79 |
| 600 | 53.7 | 21.05 |
| 800 | 61.9 | 21.31 |
| IV–V | | |
| 1 | −18.0 | *ca.* 17 |
| I–VI | | |
| 9 000 | 188.9 | 8.33 |
| 10 000 | 196.6 | 7.67 |
| 11 000 | 204.4 | 7.30 |
| II–VI | | |
| 8 860 | 170.0 | 3.12 |
| 8 743 | 185.0 | 3.73 |
| VI–IV | | |
| 9 000 | 170.4 | 9.58 |
| 10 000 | 178.8 | 9.56 |
| 11 000 | 187.3 | 9.53 |
| 12 000 | 195.8 | 9.51 |

Triple Points and Volume Changes

| *P*, atm. | *t*, °C | Direction of volume change | $\Delta V$, cm³/kg |
|---|---|---|---|
| II–III–IV | | | |
| 830 | 63.3 | III–IV | 21.35 |
| | | II–III | 9.25 |
| | | II–IV | 12.10 |
| I–II–VI | | | |
| 8730 | 186.7 | I–II | 4.75 |
| | | I–VI | 8.55 |
| | | II–VI | 3.80 |
| II–IV–VI | | | |
| 8870 | 169.2 | II–IV | 12.67 |
| | | II–VI | 3.09 |
| | | IV–VI | 9.58 |

Compressibility Difference, cm³/kg per Atm.

I > II, by *ca.* $0.0_38$.
I > VI, by *ca.* $0.0_35$.
IV > II, by *ca.* $0.0_28$.

$NH_4NO_3$.—(*Continued*)

II > III, by $0.0_2 13$.

III < IV, by $0.0_2 38$.

Thermal Expansion Difference

$cm^3/kg$ per °C

At 74 atm.

II > III by 0.038°.

IV > III by 0.115°.

The notation V is reserved for a form stable at atmospheric pressure below −20°C.

Cohen and Kooy (14) claim an error of 9 % in the changes of volume listed above for IV–III.

$NH_4Cl$ (13)

| P, atm. | t, °C | ΔV, $cm^3/kg$ |
|---|---|---|
| 0 | 184.3 | 98.5 |
| 100 | 191.1 | 109.0 |
| 200 | 198.3 | 116.4 |
| 300 | 205.7 | 121.7 |

$NH_4Br$ (13)

| | | |
|---|---|---|
| 1 | 137.8 | 64.7 |
| 100 | 146.3 | 65.2 |
| 200 | 155.1 | 65.6 |
| 300 | 164.3 | 65.9 |
| 400 | 173.5 | 66.0 |
| 500 | 183.5 | 65.9 |
| 600 | 193.8 | 65.7 |
| 700 | 204.4 | 65.4 |

$NH_4I$ (13)

| | | |
|---|---|---|
| 1 | −17.6* | 56.1 |
| 237 | 0.0 | 55.4 |
| 487 | +20.0 | 54.7 |
| 718 | 40.0 | 54.0 |
| 933 | 60.0 | 53.4 |
| 1 133 | 80.0 | 52.8 |
| 1 318 | 100.0 | 52.3 |
| 1 488 | 120.0 | 51.8 |
| 1 644 | 140.0 | 51.4 |
| 1 789 | 160.0 | 51.0 |
| 1 924 | 180.0 | 50.7 |
| 2 050 | 200.0 | 50.4 |

Difference of compressibility not greater than 0.001 $cm^3/kg$. Not known which is the greater.

*Extrapolated.

$NH_4HSO_4$ (13); *see* Fig. 4

| P, atm. | t, °C | ΔV, $cm^3/kg$ |
|---|---|---|
| I–II | | |
| 1 180 | 40 | 13.3 |
| 1 330 | 60 | 12.9 |
| 1 470 | 80 | 12.6 |
| 1 620 | 100 | 12.2 |
| 1 750 | 120 | 11.9 |
| I–III | | |
| 1 800 | 130 | 5.3 |
| 1 800 | 150 | |
| II–III | | |
| 2 000 | 129.5 | 6.3 |
| 3 000 | 144.8 | 5.5 |
| 4 000 | 158.6 | 5.2 |
| 5 000 | 171.3 | 5.8 |
| III–IV | | |
| 5 470 | 177.0 | 1.7 |
| 5 350 | 181.0 | 2.7 |
| IV–V | | |
| 6 000 | 179.3 | 4.5 |
| 7 000 | 184.1 | 3.9 |
| 8 000 | 188.1 | 3.5 |
| 9 000 | 191.6 | 3.2 |
| 10 000 | 194.8 | 2.9 |

Highly probable that there is a fifth modification at upper end of II–IV line.

Triple Points

I–II–III: 1800 atm., 126.2°.

II–III–IV: 5480 atm., 176.9°.

$SbI_3$ (8)

At 200.8°, $\Delta V = 24.0\ cm^3/kg$.

Melting pressure = 1120 atm. (data incomplete).

$Sb_2S_3$ (13)

The red modification has a reversible transformation running from 7550 atm., 0°, to 11 600 atm., 32°.

$\Delta V$ = *ca.* 10 $cm^3/kg$.

$CO_2$ (7); *cf.* (29, 31)

| P, atm. | t, °C | ΔV, $cm^3/kg$ |
|---|---|---|
| 1 | −56.6 | |
| 1 000 | −36.7 | |
| 2 000 | −19.4 | |
| 3 000 | − 4.1 | 106.1 |
| 4 000 | +10.1 | 96.7 |
| 5 000 | 23.1 | 88.3 |
| 6 000 | 35.4 | 80.8 |
| 7 000 | 46.9 | 74.1 |
| 8 000 | 57.9 | 68.3 |
| 9 000 | 68.3 | 63.3 |
| 10 000 | 78.3 | 58.9 |
| 11 000 | 87.8 | 55.2 |
| 12 000 | 97.0 | 52.0 |

For other carbon compounds *v.* the C-Table.

$SiO_2$, *v.* p. 19

$SiCl_4$ (8)

| P, atm. | t, °C | ΔV, $cm^3/kg$ |
|---|---|---|
| 2 000 | − 8.2 | 51.8 |
| 3 000 | +19.3 | 46.6 |
| 4 000 | 46.1 | 42.4 |
| 5 000 | 72.2 | 39.0 |
| 6 000 | 97 3 | 36.3 |
| 7 000 | 121.8 | 34.3 |
| 8 000 | 145.5 | 32.6 |
| 9 000 | 168.6 | 31.3 |
| 10 000 | 191.2 | 30.3 |
| 11 000 | 213.3 | 29.4 |

$TlNO_3$ (12)

| P, atm. | t, °C | ΔV, $cm^3/kg$ |
|---|---|---|
| I–II | | |
| 1 | 144.6 | 2.44 |
| 1 000 | 153.2 | 2.42 |
| 2 000 | 161.6 | 2.41 |
| 3 000 | 170.0 | 2.39 |
| 4 000 | 178.4 | 2.37 |
| 5 000 | 186.6 | 2.35 |
| 6 000 | 194.6 | 2.34 |
| 7 000 | 202.4 | 2.32 |
| II–III | | |
| 1 | 75.0 | 0.730 |
| 1 000 | 81.8 | 0.700 |
| 2 000 | 88.5 | 0.675 |
| 3 000 | 95.1 | 0.645 |
| 4 000 | 101.6 | 0.620 |
| 5 000 | 108.0 | 0.595 |
| 6 000 | 114.3 | 0.565 |
| 7 000 | 120.6 | 0.545 |
| 8 000 | 126.9 | 0.510 |
| 9 000 | 133.1 | 0.485 |
| 10 000 | 139.3 | 0.460 |
| 11 000 | 145.4 | 0.435 |
| 12 000 | 151.5 | 0.410 |

Compressibility Difference

$cm^3/kg$ per atm.

I = II approx.

At 75°, III > II by $0.0_3 5$.

At 105°, III > II by $0.0_3 3$.

At 140°, III > II by $0.0_3 15$.

$HgI_2$ (11); *cf.* (21); *see* Fig. 5

| P, atm. | t, °C | ΔV, $cm^3/kg$ |
|---|---|---|
| 1 | 127.0 | 3.4 |
| 1 000 | 150.4 | 2.1 |
| 2 000 | 166.0 | 1.2 |
| 3 000 | 175.6 | 0.6 |
| 4 000 | 180.2 | +0.2 |
| 5 000 | 181.2 | −0.1 |
| 6 000 | 177.0 | −0.5 |
| 7 000 | 166.3 | −1.0 |
| 8 000 | 145.7 | −1.8 |
| 9 000 | 111.0 | −2.9 |
| 10 000 | 62.2 | −4.2 |

I more compressible than II by *ca.* $0.0_3 4\ cm^3/kg$ per atm.

$Cu_2I_2$ (13)

$P = 11\,570 - (t - 100) \times 19.70$ atm.

$\Delta V = 5.35 - (t - 100) \times 0.0050\ cm^3/kg$ per atm.

The low temperature modification is less compressible than the high temperature modification by $0.0_3 4\ cm^3/kg$ per atm.

AgI (11); *cf.* (24, 29, 30)

| P, atm. | t, °C | ΔV, $cm^3/kg$ |
|---|---|---|
| I–II | | |
| 1 | 144.6 | 8.6 |
| 1000 | 129.1 | 9.1 |
| 2000 | 112.4 | 9.6 |
| 3000 | 94.3 | 10.2 |
| I–III | | |
| 3000 | 107.7 | 13.8 |
| 4000 | 138.0 | 12.7 |
| 5000 | 169.0 | 11.0 |
| 6000 | 201.9 | 8.9 |
| II–III | | |
| 2904 | 30.0 | 23.9 |
| 2856 | 50.0 | 23.9 |
| 2804 | 70.0 | 24.0 |
| 2744 | 90.0 | 24.1 |
| 2710 | 100.0 | 24.1 |

Triple Point and Volume Change

| P, atm. | t, °C | Direction of volume change | ΔV, $cm^3/kg$ |
|---|---|---|---|
| | | I–II | 10.1 |
| 2720 | 99.4 | I–III | 14.0 |
| | | II–III | 24.1 |

$AgNO_3$ (12); *cf.* (17); *see* Fig. 6

| P, atm. | t, °C | ΔV, $cm^3/kg$ |
|---|---|---|
| 1 | 159.4 | 2.50 |
| 1000 | 151.5 | 2.54 |
| 2000 | 143.4 | 2.59 |
| 3000 | 135.0 | 2.66 |
| 4000 | 126.2 | 2.73 |
| 5000 | 117.2 | 2.81 |
| 6000 | 107.7 | 2.89 |
| 7000 | 95.9 | 2.99 |
| 8000 | 77.5 | 3.11 |
| 8500 | 64.0 | 3.17 |
| 9000 | 42.8 | 3.24 |
| 9460 | 0.0 | 3.30 |

Compressibility Difference

| P, atm. | I–II, $cm^3/kg$ per atm. |
|---|---|
| 1 | $-0.0_3 45$ |
| 2000 | $-0.0_3 34$ |
| 4000 | $-0.0_3 24$ |
| 6000 | $-0.0_3 14$ |
| 8000 | 0.000 |
| 9000 | $+0.0_3 11$ |
| 9460 | $0.0_3 16$ |

$KClO_3$ (11)

$P = 5500 + 10.9t$, atm.

$\Delta V = 25.1 - 0.0022t$, $cm^3/kg$ per atm.

Difference of compressibility probably $> 0.0_3 2\ cm^3/kg$ per atm.

$K_2S$ (11)

$t = 146.4 + 0.0124P$.

$\Delta V = 0.95 - 0.00003P$ cm³/kg per atm.

Low temperature form is about 0.0₂1 more compressible.

**$KHSO_4$ (13); *see* Fig. 7**

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| I–II | | |
| 1 | 180.5 | 0.66 |
| 1000 | 190.7 | 1.39 |
| 2000 | 201.0 | 2.14 |
| I–IV | | |
| 2000 | 202.6 | 3.06 |
| 3000 | 220.1 | 2.88 |
| II–IV | | |
| 1750 | 200.0 | 1.13 |
| 2005 | 180.0 | 1.12 |
| 2265 | 160.0 | 1.11 |
| 2525 | 140.0 | 1.11 |
| 2780 | 120.0 | 1.10 |
| II–III | | |
| 1 | 164.2 | 5.56 |
| 1000 | 147.9 | 5.61 |
| 2000 | 131.4 | 5.66 |
| 3000 | 115.0 | 5.72 |
| III–IV | | |
| 3000 | 114.6 | 6.8 |
| 4000 | 94.8 | 6.4 |
| 5000 | 72.2 | 6.1 |
| 6000 | 46.0 | 5.7 |

Triple Points and Volume Changes

| $P$, atm. | $t$, °C | Direction of volume change | $\Delta V$, cm³/kg |
|---|---|---|---|
| I–II–IV | | | |
| 1770 | 198.6 | I–II | 1.97 |
| | | II–IV | 1.13 |
| | | I–IV | 3.10 |
| II–III–IV | | | |
| 2805 | 118.2 | II–III | 5 70 |
| | | II–IV | 1.10 |
| | | III–IV | 6.80 |

Thermal Expansion Difference

At 1 atm. I > II by 0.5 cm³/kg per °C.

At 1 atm. II > III by 0.04 cm³/kg per °C.

III probably > IV.

**$KNO_2$ (11)**

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| 5 000 | − 0.3 | 31.0 |
| 6 000 | +17.4 | 32.4 |
| 7 000 | 35.7 | 33.8 |
| 8 000 | 56.6 | 35.1 |
| 9 000 | 83.1 | 36.5 |
| 10 000 | 122.3 | 37.8 |

**$KNO_3$ (12); *cf.* (17); *see* Fig. 8**

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| I–III | | |
| 1 | 125.8 | 14.2 |
| 1000 | 147.8 | 13.9 |
| 2000 | 169.1 | 13.7 |
| 3000 | 190.0 | 13.6 |
| 4000 | 210.6 | 13.5 |
| I–II | | |
| 1 | 127.7 | 6.0 |
| II–III | | |
| 495 | 120.0 | 10.5 |
| 1260 | 100.0 | 12.9 |
| 1840 | 80.0 | 14.1 |
| 2275 | 60.0 | 14.8 |
| 2605 | 40.0 | 15.3 |
| 2860 | 20.0 | 15.6 |
| II–IV | | |
| 2580 | 0.0 | 44.7 |
| 2700 | 10.0 | 44.4 |
| 2825 | 20.0 | 41.0 |
| III–IV | | |
| 3000 | 27.7 | 28.2 |
| 4000 | 66.3 | 27.3 |
| 5000 | 102.5 | 26.7 |
| 6000 | 136.3 | 26.3 |
| 7000 | 167.8 | 25.7 |
| 8000 | 196.3 | 25.3 |
| 9000 | 221.5 | 24.9 |

Triple Points and Volume Changes

| $P$, atm. | $t$, °C | Direction of volume change | $\Delta V$, cm³/kg |
|---|---|---|---|
| I–III–IV | | | |
| 2835 | 21.3 | II–III | 15.6 |
| | | III–IV | 28.4 |
| | | II–IV | 44.0 |
| I–II–III | | | |
| 110 | 128.3 | I–III | 14.2 |
| | | II–III | 8.9 |
| | | I–II | 5.3 |

Compressibility Difference

III > I, by *ca.* 0.001 cm³/kg per atm.

III > IV, by *ca.* 0.06 cm³/kg per atm.

III probably > II.

Thermal Expansion

III > I, by *ca.* 0.06 cm³/kg per °C.

**KCNS (11)**

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–I | | |
| 1 | 171.2* [173.2] | 49.7* |
| 1000 | 193.3 | 46.2 |

* Extrapolated.

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| I–II | | |
| 1 | 140.0 | 3.06 |
| 1000 | 158.5 | 2.43 |
| 2000 | 174.9 | 1.98 |
| 3000 | 190.6 | 1.68 |
| 4000 | 205.7 | 1.49 |

**$RbNO_3$* (12)**

| | | |
|---|---|---|
| II–III | | |
| 1 | 164.4 | 6.88 |
| 1000 | 174.4 | 6.45 |
| 2000 | 184.1 | 6.00 |
| 3000 | 193.5 | 5.57 |
| 4000 | 202.6 | 5.12 |
| 5000 | 211.5 | 4.69 |
| 6000 | 220.3 | 4.26 |

The difference of volume between I and II is probably very small (35).

* Material somewhat impure with acid.

**$CsNO_3$ (12)**

| | | |
|---|---|---|
| 1 | 153.7 | 4.05 |
| 1000 | 163.4 | 3.86 |
| 2000 | 172.9 | 3.68 |
| 3000 | 182.2 | 3.50 |
| 4000 | 191.3 | 3.32 |
| 5000 | 200.1 | 3.13 |
| 6000 | 208.8 | 2.94 |

At 80 atm., thermal expansion of I > II by 0.033 cm³/kg per °C. At 4850 atm., the compressibility of I > II by 0.00031 cm³/kg per atm.

**℄-Table, the ℄-arrangement**

**$CBr_4$ (11, 34); *see* Fig. 9**

I–II

$t = 46.2 + 0.0315P$;

$\Delta V = 20.5 - 0.0026P$ cm³/kg per atm.

I–III

$t = 119.5 + (P - 2175) \times 0.1089$;

$\Delta V = 2.9$ cm³/kg per atm.

II–III

$t = 108.5 + (P - 1930) \times 0.0246$;

$\Delta V = 12.3 - 0.0013P$ cm³/kg per atm.

Triple point, I–II–III, 2110 atm., 112.6°

W. Wahl (34) has determined the melting point at atm. pressure to be 92° and finds this to be raised 1° by 15.5 atm. for a small pressure range. He also has made initial determinations of the transition I–II.

**$CCl_4$ (7); *cf.* (2, 29); *see* Fig. 10**

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–I | | |
| 1 | −22.6 [−23.0] | 25.8 |
| 1 000 | +15.3 | 19.9 |
| 2 000 | 48.9 | 16.3 |
| 3 000 | 78.9 | 13.8 |
| 4 000 | 106.0 | 11.6 |
| 5 000 | 130.8 | 9.9 |
| 6 000 | 154.2 | 8.3 |
| 7 000 | 176.2 | 7.0 |
| 8 000 | 197.4 | 6.0 |
| 9 000 | 217.6 | 5.2 |
| I–II | | |
| 2 000 | − 4.6 | 24.2 |
| 3 000 | +15.7 | 23.3 |
| 4 000 | 35.3 | 22.4 |
| 5 000 | 54.1 | 21.3 |
| 6 000 | 72.3 | 20.2 |
| 7 000 | 90.0 | 19.0 |
| 8 000 | 107.2 | 17.9 |
| I–III | | |
| 9 000 | 125.8 | 22.5 |
| 10 000 | 145 9 | 22.2 |
| 11 000 | 166.0 | 21.7 |
| 12 000 | 186.2 | 21.1 |
| II–III | | |
| 6 500 | + 6.7 | 5.6 |
| 7 000 | 34.3 | 5.6 |
| 7 500 | 61.9 | 5.6 |
| 8 000 | 89.5 | 5.5 |
| 8 500 | 117.1 | 5.4 |

Triple Points and Volume Changes

| $P$, atm. | $t$, °C | Direction of volume change | $\Delta V$, cm³/kg |
|---|---|---|---|
| I–II–III | | | |
| 8460 | 115 | I–II | 17.3 |
| | | I–III | 22.7 |
| | | II–III | 5.4 |

**$CHBr_3$, Bromoform (8)**

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| 1 | 7.78 | 39.1 |
| 1 000 | 32.3 | 35.4 |
| 2 000 | 55.3 | 32.0 |
| 3 000 | 77.2 | 28.9 |
| 4 000 | 97.3 | 26.3 |
| 5 000 | 116.3 | 23.8 |
| 6 000 | 134.1 | 21.7 |
| 7 000 | 151.1 | 19.9 |
| 8 000 | 167.4 | 18.4 |
| 9 000 | 183.3 | 17.3 |
| 10 000 | 199.0 | 16.3 |
| 11 000 | 214.6 | 15.4 |

$CHCl_3$, Chloroform (7)

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| 1 | −61.0 | |
| | [−63.5] | |
| 1 000 | −43.4 | |
| 2 000 | −26.5 | |
| 3 000 | −10.3 | 52.6 |
| 4 000 | + 5.4 | 49.2 |
| 5 000 | 20.4 | 46.0 |
| 6 000 | 34.8 | 43.2 |
| 7 000 | 48.7 | 40.6 |
| 8 000 | 62.0 | 38.3 |
| 9 000 | 75.1 | 36.3 |
| 10 000 | 87.9 | 34.5 |
| 11 000 | 100.4 | 33.0 |
| 12 000 | 112.6 | 31.6 |

$CH_2I_2$, Methylene iodide (29); *see* Fig. 11*

| $P$, atm. | $t$, °C | |
|---|---|---|
| 1 | 5.73 | (L–I) |
| 135 | 8.0 | (L–I) |
| 230 | 10 | (L–II) |
| 710 | 20 | (L–II) |
| 1200 | 30 | (L–II) |
| 1750 | 40 | (L–II) |
| 1995 | 44 | (L–III) |
| 2350 | 50 | (L–III) |
| 2960 | 60 | (L–III) |
| 1 | −6.5 | (I–IV) |
| 175 | 0 | (I–IV) |
| 270 | +5 | (I–IV) |
| 320 | 9 | (I–II) |
| 180 | 8.6 | (I–II) |
| 325 | 9.4 | (I–II) |
| 365 | 10 | (II–IV) |
| 1000 | 20 | (II–IV) |
| 1540 | 30 | (II–IV) |
| 1825 | 38 | (II–III) |
| 1825 | 38.0 | (II–III) |
| 1930 | 42.8 | (II–III) |
| 1825 | 38.0 | (III–IV) |
| 2195 | 44 | (III–IV) |
| 2450 | 48 | (III–IV) |

Triple Points

| $P$, atm. | $t$, °C | |
|---|---|---|
| 180 | 8.6 | (L–I–II) |
| 325 | 9.4 | (I–II–IV) |
| 1930 | 42.8 | (L–II–III) |
| 1825 | 38.0 | (II–III–IV) |

* Details of this diagram somewhat uncertain; in particular the reality of the separate existence of III seems to need verification.

$CH_4N_2O$, Urea (13); *see* Fig. 12

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| I–III | | |
| 4180 | 0.0 | 49.6 |
| 4640 | 20.0 | 49.4 |
| 5100 | 40.0 | 49.2 |
| 5560 | 60 | 49.0 |
| 6020 | 80 | 48.8 |
| 6480 | 100 | 48.6 |
| I–II | | |
| 6521 | 100.0 | 48.2 |
| 6628 | 120.0 | 46.5 |
| 6735 | 140.0 | 44.2 |
| 6843 | 160.0 | 41.3 |

Triple Point and Volume Changes

| $P$, atm. | $t$, °C | Direction of volume change | $\Delta V$, cm³/kg |
|---|---|---|---|
| I–II–III | | | |
| 6535 | 102.3 | I–III | 48.6 |
| | | I–II | 48.0 |
| | | II–III | 0.6 |

Melts 131.7° at 1 atm., 150° at 3000 atm. $\Delta V$ (L–I) = 10 cm³/kg.

Compressibility Difference

I < II by *ca.* 0.004 cm³/kg per atm.

I < III by < 0.004 cm³/kg per atm.

$NH_4CNS$ (11)

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| 1 | 87.7 | 40.9 |
| 1000 | 55.2 | 41.4 |
| 2000 | +26.1 | 41.9 |
| 3000 | − 0.5 | 42.4 |

Compressibility Difference on Transition Line

cm³/kg per atm.

| $P$, atm. | Δ |
|---|---|
| 1 | 0.0051 |
| 1000 | 0.0043 |
| 2000 | 0.0035 |
| 3000 | 0.0028 |

The high temp. phase is the less compressible.

$C_2Cl_6$, Hexachloroethane (11); *cf.* (29)

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| I–II | | |
| 1 | 71.1 | 28.0 |
| 1000 | 104.8 | 25.9 |
| 2000 | 138.5 | 23 7 |
| II–III | | |
| 1 | 42.7 | 9.7 |
| 1000 | 70.7 | 8.5 |
| 2000 | 98.0 | 7.5 |
| 3000 | 123.4 | 6.7 |
| 4000 | 149.5 | 6.1 |
| 5000 | 173.2 | 5.6 |
| 6000 | 195.5 | 5.2 |

Difference of Compressibility

Δ = II–III; cm³/kg per atm.

| $P$, atm. | Δ |
|---|---|
| 1 | 0.0024 |
| 2000 | 0.0020 |
| 4000 | 0.0017 |
| 6000 | 0.0015 |

$C_2H_3ClO_2$, Chloroacetic acid (7, 18); *cf.* (16, 29)

| $P$, atm. | $t$, °C* | $\Delta V$, cm³/kg |
|---|---|---|
| L–stable solid | | |
| 1 | 62.53 | 107 |
| | [61.2] | |
| 2 000 | 90 | 86 |
| 4 000 | 115 | 67 |
| 6 000 | 137 | 51 |
| 8 000 | 158 | 37 |
| 10 000 | 177 | 25 |
| L–unstable solid | | |
| 1 | 50.0 | |
| 800 | 65.0 | |

* Approximate values.

$C_2H_4O_2$, Acetic acid (13); *cf.* (25, 29, 33)

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–I | | |
| 1 | 16.68 | 156.0 |
| 500 | 28.2 | 132.3 |
| 1 000 | 38.3 | 113.8 |
| 1 500 | 47.3 | 99.3 |
| 2 000 | 55.3 | 87.3 |
| L–II | | |
| 2 000 | 55.2 | 99.6 |
| 3 000 | 70.9 | 89.9 |
| 4 000 | 85.2 | 81.8 |
| 5 000 | 98.4 | 75.0 |
| 6 000 | 110.5 | 68.8 |
| 7 000 | 121.8 | 63.6 |
| 8 000 | 132.3 | 59.2 |
| 9 000 | 142.1 | 55.8 |
| 10 000 | 151.1 | 53.0 |
| 11 000 | 159.5 | 50.8 |
| I–II | | |
| 1 040 | 0 | 14.0 |
| 1 485 | 25 | 13.6 |
| 1 930 | 50 | 13.1 |

Triple Point and Volume Changes

| $P$, atm. | $t$, °C | Direction of volume change | $\Delta V$, cm³/kg |
|---|---|---|---|
| I–II–L | | | |
| 2033 | 55.7 | L–II | 99.2 |
| | | L–I | 86.2 |
| | | I–II | 13.0 |

At 76 atm. L more expansible than I by 0.50 cm³/kg per °C.

$C_2H_5NO$, Acetamide (13, 18)

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–I | | |
| 1 | 81.5 | 109.8 |
| | [81.0] | |
| 1 000 | 93.5 | 84.5 |
| 2 000 | 103.7 | 65.8 |
| 3 000 | 112.5 | 52.1 |
| 4 000 | 119.9 | 41.7 |
| 5 000 | 125.9 | 33.4 |
| L–II | | |
| 4 000 | 113.1 | 73.7 |
| 5 000 | 124.7 | 66.5 |
| 6 000 | 135.0 | 59.6 |
| 7 000 | 144.6 | 53.2 |
| 8 000 | 153.3 | 47.9 |
| 9 000 | 161.4 | 43.6 |
| 10 000 | 168.9 | 40.1 |
| 11 000 | 175.9 | 37.4 |
| I–II | | |
| 5 810 | 20.0 | 30.2 |
| 5 740 | 40.0 | 30.5 |
| 5 645 | 60.0 | 30.9 |
| 5 535 | 80.0 | 31.5 |
| 5 310 | 100.0 | 32.1 |
| 5 265 | 120.0 | 32.8 |
| L–unstable solid | | |
| 1 | 69.4 | |
| 1 000 | 86.6 | |
| 2 000 | 97.4 | |
| 3 000 | 105.0 | |

Triple Point and Volume Changes

| $P$, atm. | $t$, °C | Direction of volume change | $\Delta V$, cm³/kg |
|---|---|---|---|
| L–I–II | | | |
| 5220 | 127.0 | L–I | 31.9 |
| | | L–II | 64.9 |
| | | I–II | 33.0 |

Compressibility difference, (II − I) = 0.0027 at 20°, and 0.0011 at 120°, cm³/kg per atm. Relation linear.

**$C_3H_6O$, Acetone (7, 10)**

Under 10 000 atm., freezing temperature = *ca.* 40°.

**$C_2H_7NO_2$, Urethane (11); *cf.* (27, 29); *see* Fig. 13**

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–I | | |
| 1 | 47.9 | 59.9 |
| 500 | 53.2 | 45.8 |
| 1 000 | 57.6 | 37.1 |
| 1 500 | 61.3 | 31.3 |
| 2 000 | 64.6 | 27.3 |
| L–II | | |
| 2 500 | 67.9 | 29.5 |
| 3 000 | 71.2 | 22.8 |
| 3 500 | 74.0 | 19.7 |
| 4 000 | 76 4 | 18.6 |
| L–III | | |
| 4 500 | 82.1 | 62.3 |
| 5 000 | 88.5 | 60.4 |
| 6 000 | 100.2 | 56.4 |
| 7 000 | 111.1 | 52.7 |
| 8 000 | 121.7 | 49.1 |
| 9 000 | 131.8 | 45.7 |
| 10 000 | 141.5 | 42.6 |
| 11 100 | 151.1 | 39.5 |
| 12 000 | 160.3 | 36.7 |
| I–III | | |
| 3 060 | 0 | 57.2 |
| 3 150 | 10 | 57.3 |
| 3 240 | 20 | 57.4 |
| I–II | | |
| 3 170 | 30 | 9.3 |
| 2 930 | 40 | 9.5 |
| 2 680 | 50 | 9.8 |
| 2 440 | 60 | 10.0 |
| II–III | | |
| 3 360 | 30 | 48.0 |
| 3 520 | 40 | 47.5 |
| 3 680 | 50 | 47.0 |
| 3 830 | 60 | 46.4 |
| 4 000 | 70 | 45.9 |

Triple Points and Volume Changes

| $P$, atm. | $t$, °C | Direction of volume change | $\Delta V$, cm³/kg |
|---|---|---|---|
| L–I–II | | | |
| 2270 | 66.2 | L–I | 25.3 |
| | | L–II | 35.5 |
| | | I–II | 10.2 |
| L–II–III | | | |
| 4090 | 76.8 | L–II | 18.4 |
| | | L–III | 64.0 |
| | | II–III | 45.6 |
| I–II–III | | | |
| 3290 | 25.5 | I–II | 9.2 |
| | | II–III | 48.2 |
| | | I–III | 57.4 |

**$C_2H_6O_4$, Dimethyl oxalate (8); *cf.* (29)**

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–solid | | |
| 1 | 54.24 | 145.3 |
| 1000 | 76.5 | 110.8 |
| 2000 | 97.1 | 95.0 |
| 3000 | 116.5 | 85.5 |
| 4000 | 134.9 | 79.0 |
| 5000 | 152.4 | 73.6 |
| 6000 | 169.1 | 68.6 |
| 7000 | 185.2 | 64.0 |
| 8000 | 200.8 | 59.5 |

**$C_6H_4BrNO_2$, *m*-Bromonitrobenzene (37)**

**$C_6H_4ClNO_2$, *m*-Chloronitrobenzene (37)**

**$C_6H_5Br$, Bromobenzene (8)**

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–solid | | |
| 1 | −31.1 | |
| 1 000 | −11.5 | 48.4 |
| 2 000 | + 6 4 | 42.5 |
| 3 000 | 22.8 | 37.8 |
| 4 000 | 37.8 | 34.0 |
| 5 000 | 51.5 | 30.9 |
| 6 000 | 64.5 | 28.3 |
| 7 000 | 76.9 | 26.2 |
| 8 000 | 88.7 | 24.4 |
| 9 000 | 100.2 | 23.0 |
| 10 000 | 111.1 | 21.8 |
| 11 000 | 121.6 | 20.9 |
| 12 000 | 131.8 | 20.2 |

Difference of Compressibility between Solid and Liquid along Melting Curve (Directly Measured) cm³/kg per atm.

| $P$, atm. | Δ |
|---|---|
| 1 | 0.04 |
| 3 000 | .006 |
| 6 000 | .003 |
| 9 000 | .001 |
| 12 000 | .0005 |

**$C_6H_5Cl$, Chlorobenzene (8)**

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–solid | | |
| 1 | −45.5 | |
| 1 000 | −27.5 | |
| 2 000 | −11.0 | 56.1 |
| 3 000 | + 4.3 | 50.8 |
| 4 000 | 18.5 | 46.4 |
| 5 000 | 31.8 | 42.6 |
| 6 000 | 44.2 | 39.4 |
| 7 000 | 55.9 | 36 6 |
| 8 000 | 66.9 | 34.2 |
| 9 000 | 77.5 | 32 2 |
| 10 000 | 87.9 | 30.6 |
| 11 000 | 97.8 | 29.2 |
| 12 000 | 107.4 | 28.1 |

**$C_6H_5NO_2$, Nitrobenzene (7); *cf.* (29)**

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–solid | | |
| 1 | 5.6 | 81.4 |
| 1 000 | 27.9 | 73.3 |
| 2 000 | 49.5 | 66.1 |
| 3 000 | 70.3 | 60.0 |
| 4 000 | 90.2 | 55.1 |
| 5 000 | 108.4 | 51.5 |
| 6 000 | 125.7 | 48.5 |
| 7 000 | 142.2 | 45.9 |
| 8 000 | 158.2 | 43.5 |
| 9 000 | 173.9 | 41.5 |
| 10 000 | 189.1 | 39.7 |
| 11 000 | 204.2 | 38.1 |

**$C_6H_5NO_3$, *p*-Nitrophenol (8)**

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–solid | | |
| 1 | 112.4 | 89.1 |
| 1000 | 138.5 | 73.6 |
| 2000 | 160.9 | 61.0 |
| 3000 | 181.8 | 51.2 |
| 4000 | 201.3 | 43.6 |

**$C_6H_6$, Benzene (7); *cf.* (16, 28, 29)**

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–I | | |
| 1 | 5.4 | 131.7 |
| 1 000 | 33.3 | 103.5 |
| 2 000 | 58.0 | 86.3 |
| 3 000 | 79.9 | 75.0 |
| 4 000 | 99.3 | 66.8 |
| 5 000 | 117.4 | 60.5 |
| 6 000 | 134.6 | 55.5 |
| 7 000 | 150.8 | 51.3 |
| 8 000 | 166.4 | 47.5 |
| 9 000 | 181.2 | 44.0 |
| 10 000 | 195.4 | 41.0 |
| 11 000 | 209.0 | 38.4 |
| I–II | | |
| 11 860 | 100 | 10.5 |
| 11 690 | 120 | 11.1 |
| 11 560 | 140 | 11.6 |
| 11 480 | 160 | 12.1 |
| 11 430 | 180 | 12.6 |
| 11 460 | 200 | 13.0 |

**$C_6H_6O$, Phenol (11); *cf.* (16, 29, 30)**

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–I | | |
| 1 | 40.9 | 56.7 |
| 1 000 | 53.8 | 39.0 |
| 2 000 | 63.9 | 27.4 |
| I–II | | |
| $P = 1284 + 115t$, atm. $\Delta V = 59.2 - 0.6t$, cm³/kg | | |
| L–II | | |
| 2 000 | 63.5 | 82.6 |
| 3 000 | 84.0 | 76.1 |
| 4 000 | 102.1 | 70.7 |
| 5 000 | 118.6 | 66 2 |
| 6 000 | 133.9 | 62.3 |
| 7 000 | 148.4 | 58.8 |
| 8 000 | 162.3 | 55.7 |
| 9 000 | 175.8 | 52.9 |
| 10 000 | 188.7 | 50.4 |
| 11 000 | 201.5 | 48.1 |
| 12 000 | 214.0 | 46.0 |

Triple Point and Volume Changes

| $P$, atm. | $t$, °C | Direction of volume change | $\Delta V$, cm³/kg |
|---|---|---|---|
| L–I–II | | | |
| 2015 | 64.0 | L–I | 27.0 |
| | | L–II | 82.5 |
| | | I–II | 55.5 |

Compressibility Difference cm³/kg per atm.

At triple point, I > II by 0.005.

At 74 atm., L > I by 0.025.

**$C_6H_6O_2$, Resorcinol (15)**

L–I

$t = 110.0° + 0.0145P - 0.0_5110P^2$ (to 3000 atm.)

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| I–II | | |
| 1 | 75 | |
| 500 | 44 | |
| 1000 | 20 | |
| 1500 | +6 | |
| 2000 | −2 | |
| 2500 | −6 | |

Results at higher pressures in much doubt.

**$C_6H_7N$, Aniline (7); *cf.* (29)**

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–solid | | |
| 1 | − 6.4 | 85.4 |
| 1 000 | +14.0 | 78.2 |
| 2 000 | 32.9 | 72.0 |
| 3 000 | 50.2 | 68.9 |
| 4 000 | 66.5 | 62.6 |
| 5 000 | 81.6 | 58.8 |
| 6 000 | 95.7 | 55.5 |
| 7 000 | 109.4 | 52.4 |
| 8 000 | 122.5 | 49.6 |
| 9 000 | 135.0 | 46.9 |
| 10 000 | 147.1 | 44.4 |
| 11 000 | 158.9 | 42.0 |
| 12 000 | 170.3 | 39.6 |

$C_6H_{11}NO_2$, Ethyl aminocrotonate [18]

| $P$, atm. | $t$, °C, stable | $t$, °C, unstable |
|---|---|---|
| 1 | 34.0 | 19.9 |
| 1000 | 51.2 | 37.6 |
| 2000 | 64.4 | 51.9 |
| 3000 | 75.6 | 63.5 |

$C_7H_7NO_3$, Nitroanisole [27.5]

$C_7H_8O$, *o*-Cresol [7]; *cf.* [29]

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–I | | |
| 1 | 30.8 | 83.8 |
| 1 000 | 48.2 | 67.1 |
| 2 000 | 62.8 | 55.0 |
| 3 000 | 75.2 | 46.3 |
| 4 000 | 86.1 | 40.0 |
| 5 000 | 95.8 | 35.0 |
| 6 000 | 104.5 | 31.2 |
| 7 000 | 112.6 | 28.2 |
| 8 000 | 120.0 | 25.9 |
| L–II | | |
| 6 000 | 105.5 | 55.2 |
| 7 000 | 119.5 | 51.9 |
| 8 000 | 132.6 | 49.1 |
| 9 000 | 145.2 | 46.8 |
| 10 000 | 157.2 | 44.8 |
| 11 000 | 168.9 | 43.1 |
| 12 000 | 180.2 | 41.8 |

Triple Point and Volume Changes

| $P$, atm. | $t$, °C | Direction of volume change | $\Delta V$, cm³/kg |
|---|---|---|---|
| L–I–II | | | |
| 5900 | 130.2 | L–I | 31.7 |
| | | I–II | 23.8 |
| | | L–II | 55.5 |

$C_7H_9N$, *p*-Toluidine [8]; *cf.* [16, 19, 23, 29]

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–solid | | |
| 1 | 43.6 | 141.3 |
| 1000 | 69.8 | 118.9 |
| 2000 | 92.9 | 103.1 |
| 3000 | 114.0 | 92.2 |
| 4000 | 133.8 | 84.3 |
| 5000 | 153.1 | 77.9 |
| 6000 | 172.1 | 72.5 |
| 7000 | 190.8 | 67.8 |
| 8000 | 209.4 | 63.7 |

$C_8H_6O_2$, Phthalide [18]

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–solid | | |
| 1 | 73.0 | |
| 1000 | 101 | |
| 2000 | 127 | |
| 3000 | 152 | |

$C_8H_8O$, Acetophenone [8]
At 200°, $\Delta V$ = 45 cm³/kg.
Melting pressure, 11 200 atm.

$C_{10}H_8$, Naphthalene [8]
Melting pressure at 200°, *ca.* 4000 atm.

$C_{10}H_{12}O$, Anethole [8]
$\Delta V$ at 74 atm. = 79.3 cm³/kg.
Melting pressure at 100°, *ca.* 4050 atm.

$C_{10}H_{16}O$, Camphor [13, 16]; *see* Fig. 14

| $P$, atm. | $t$, °C | $\Delta V$,* cm³/kg |
|---|---|---|
| I–II | | |
| 1 | 87.1 | 1.87 |
| 500 | 118.6 | 1.87 |
| 1 000 | 148.0 | 1.87 |
| 1 500 | 175.8 | 1.87 |
| 2 000 | 202.5 | 1.87 |
| II–III | | |
| 1 610 | 0 | 58.5 |
| 2 060 | 10 | 56.3 |
| 2 570 | 20 | 54.0 |
| III–IV | | |
| 3 000 | 26.5 | 37.4 |
| 4 000 | 39.2 | 34.4 |
| 5 000 | 51.3 | 31.7 |
| 6 000 | 62.8 | 29.1 |
| 7 000 | 73.6 | 26.8 |
| 8 000 | 83.9 | 24.7 |
| 9 000 | 93.6 | 22.8 |
| 10 000 | 102.7 | 21.1 |
| 11 000 | 111.2 | 19.6 |
| 12 000 | 119.1 | 18.3 |
| IV–V | | |
| 2 790 | 20 | |
| 3 350 | 60 | |
| 3 775 | 90 | |
| II–V | | |
| 2 710 | 20 | |
| 2 864 | 40 | |
| 3 036 | 60 | |
| 3 226 | 80 | |
| 3 434 | 100 | |
| 3 662 | 120 | |
| 3 661 | 120 | 6.9 |
| 3 880 | 140 | 6.1 |
| 4 081 | 160 | 5.7 |
| 4 265 | 180 | 5.4 |
| 4 435 | 200 | 5.2 |
| VI–IV | | |
| 4 000 | 90.1 | 3.5 |
| 5 000 | 108.8 | 2.2 |
| 6 000 | 124.2 | 1.2 |
| 7 000 | 136.5 | 0.5 |
| V–VI | | |
| 3 660 | 90 | |
| 3 660 | 110 | |
| L–I | | |
| 1 | 177.6 | |

*$\Delta V$ is not always very exact.

Initial rise of melting temperature, 129° for 1000 atm.

III is more compressible than IV; difference 0.005 at 3000 and 0.0017 at 12 000 cm³/kg per atm.

Triple points are not accurately located.

$C_{10}H_{20}O$, Menthol [8]
$\Delta V$ at 74 atm. = 61.2 cm³/kg.

$C_{12}H_{11}N$, Diphenylamine [7]; *cf.* [3, 23, 27, 29]

| $P$, atm. | $t$, °C | $\Delta V$, cm³/kg |
|---|---|---|
| L–solid | | |
| 1 | 54.0 | 95.8 |
| 1000 | 80.3 | 80.1 |
| 2000 | 104.5 | 70.3 |
| 3000 | 126.8 | 63.3 |
| 4000 | 147.4 | 58.0 |
| 5000 | 166.5 | 53.4 |
| 6000 | 184.3 | 49.7 |
| 7000 | 201.0 | 46.6 |
| 8000 | 216.9 | 44.1 |

$C_{13}H_{10}O$, Benzophenone [8]; *cf.* [16, 29]

| | | |
|---|---|---|
| L–solid | | |
| 1 | 47.8 | 90.4 |
| 1000 | 75.4 | 77.3 |
| 2000 | 100.5 | 68.4 |
| 3000 | 123.4 | 61.8 |
| 4000 | 144.7 | 56.7 |
| 5000 | 164.5 | 52.6 |
| 6000 | 183.3 | 49.2 |
| 7000 | 201.1 | 46.2 |
| 8000 | 218.2 | 43.6 |

$C_{14}H_{14}$, Dibenzyl [19]

| | | |
|---|---|---|
| L–solid | | |
| 1 | 51.3 | 113 |
| 500 | 68.4 | 105 |
| 1000 | 83.2 | 96 |
| 1500 | 97.3 | 88 |

## DIAGRAMS

The arrows denote the direction in which the volume change on transition is becoming numerically less.

$\alpha$, $\beta$, $C_p$. The location of these symbols shows the side of the transition line corresponding to the form having the higher value of compressibility, thermal expansion, or specific heat at constant pressure.

The dotted enclosing lines delimit the region of indifference.

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(For a key to the periodicals see end of volume)

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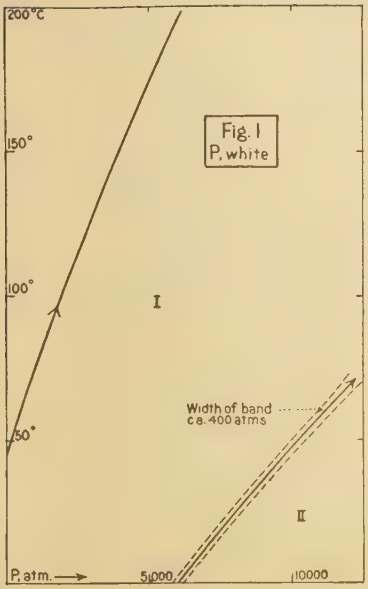
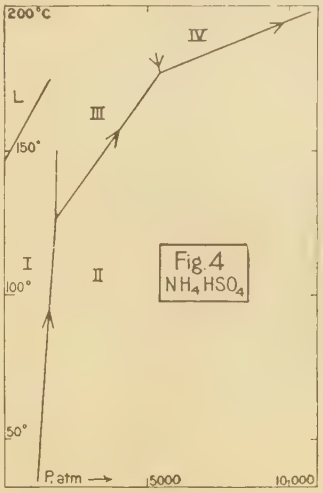
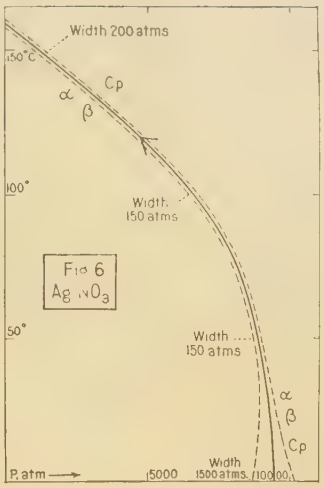
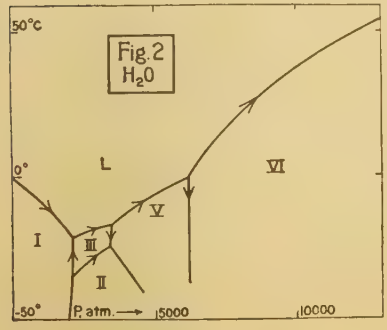
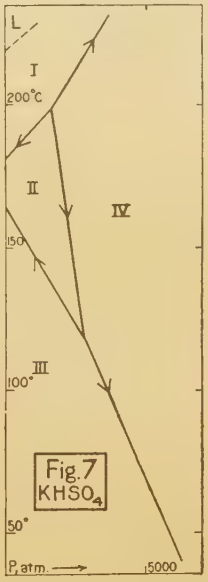
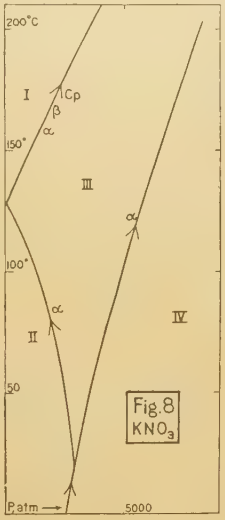

200°C
150°
100°
50°
Fig. 1
P, white
I
II
Width of band
ca. 400 atms
P, atm.
5,000
10000

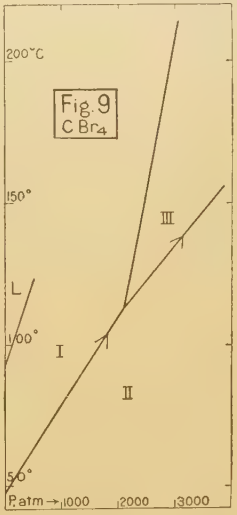

200°C
L
150°
100°
50°
I
II
III
IV
Fig. 4
$NH_4HSO_4$
P, atm
5000
10,000

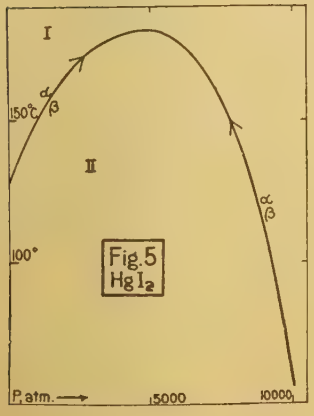

Width 200 atms
150°C
Cp
α
β
100°
Width
150 atms
Fig 6
$AgNO_3$
50°
Width
150 atms
α
β
Cp
P, atm
5000
Width
1500 atms.
10000

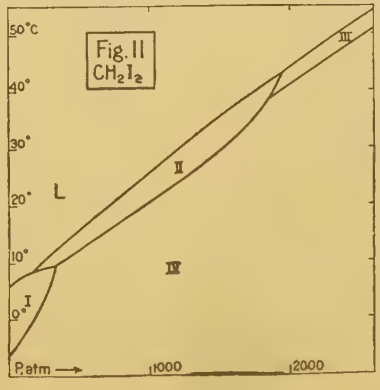

50°C
Fig. 2
$H_2O$
0°
L
VI
V
I
III
II
-50°
P, atm.
5000
10000

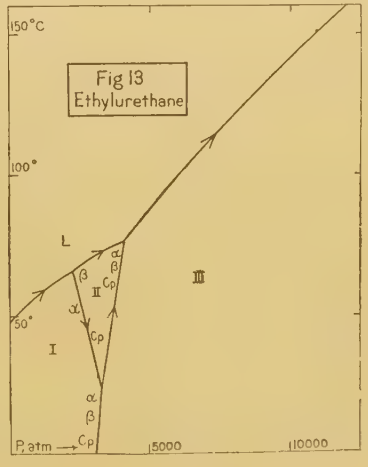

L
I
200°C
II
IV
150
III
100°
Fig. 7
$KHSO_4$
50°
P, atm.
5000


200°C
I
Cp
β
α
150°
III
α
100°
α
II
IV
50
Fig. 8
$KNO_3$
P atm
5000


200°C
Fig. 9
$CBr_4$
150°
III
L
100°
I
II
50°
P atm
1000
2000
3000


I
α
150°C
β
II
α
β
100°
Fig. 5
$HgI_2$
P, atm.
5000
10000


50°C
Fig. 11
$CH_2I_2$
III
40°
30°
II
20°
L
10°
IV
0°
I
P atm
1000
2000


150°C
Fig 13
Ethylurethane
100°
L
β
α
β
α
Cp
II
III
50°
α
Cp
I
α
β
P, atm
Cp
5000
10000

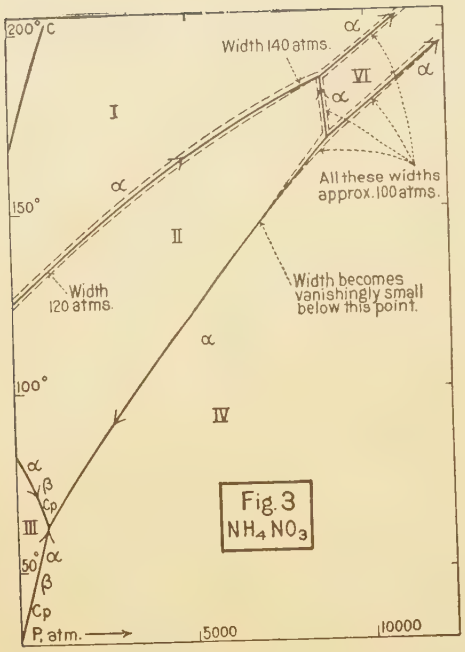
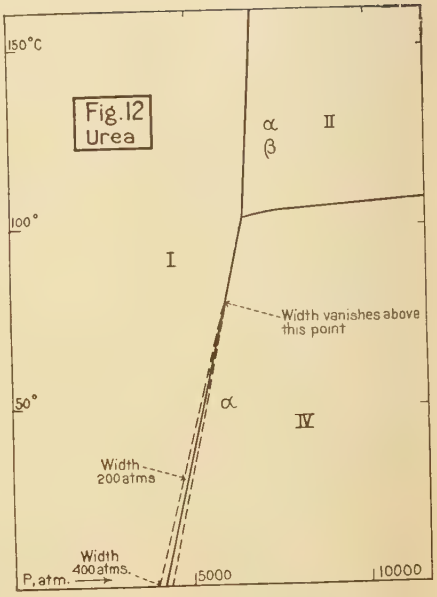
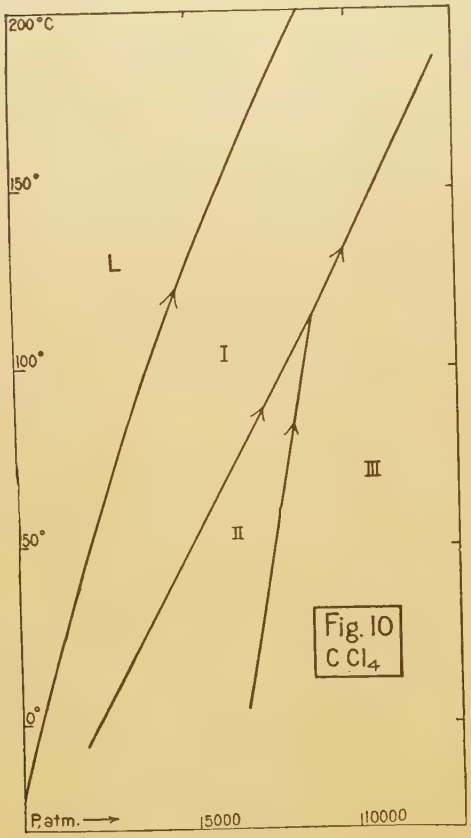
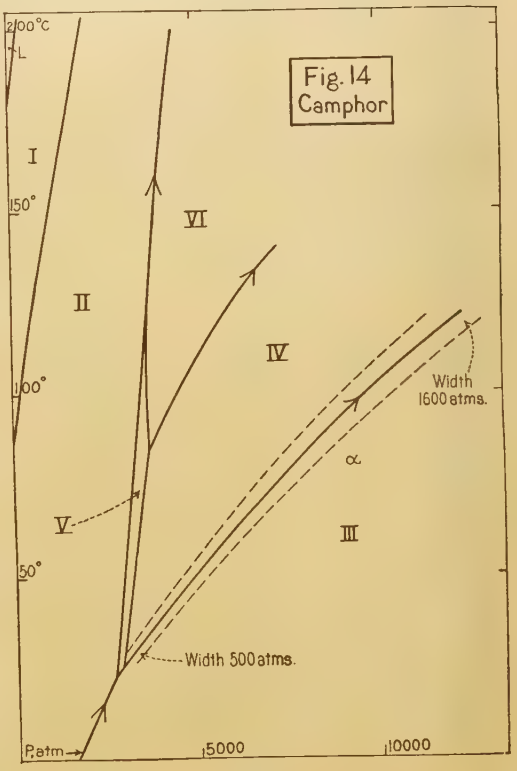

200°C
Width 140 atms.
α
VI
α
α
I
α
All these widths approx. 100 atms.
150°
II
Width 120 atms.
Width becomes vanishingly small below this point.
α
100°
IV
α
β
Cp
III
50°
α
β
Cp
P, atm.
5000
10000

Fig. 3
$NH_4NO_3$


150°C
Fig. 12
Urea
α
β
II
100°
I
Width vanishes above this point
50°
α
IV
Width 200 atms
Width 400 atms.
P, atm.
5000
10000


200°C
150°
L
100°
I
III
50°
II
10°
Fig. 10
C Cl4
P, atm.
5000
10000


200°C
L
Fig. 14
Camphor
I
150°
VI
II
IV
100°
Width 1600 atms.
α
V
III
50°
Width 500 atms.
P, atm.
5000
10000

# INTERNAL PRESSURE

J. H. Hildebrand

Internal pressure is the name given to the force of cohesion which, together with the external pressure, balances the thermal pressure. It is indirectly measured by such properties as surface tension, heat of vaporization, expansion and compressibility. It has most frequently been defined by the various equations of state. For example, arranging the familiar van der Waals equation in the form:

$$p + \frac{a}{v^2} = \frac{RT}{v - b},$$

$a/v^2$ may be called the cohesive pressure and $RT/(v - b)$ the thermal pressure, but since for liquids and solids $p$ is small compared with the other two terms, either of them may be used as a measure of internal pressure, whenever the "constants" a and b are known. Any equation of state which can be put into a corresponding form may be similarly used (*cf.* Sutherland (9)).

Unfortunately little work has been done upon the application of equations of state to ordinary liquids, and the values of internal pressure calculated from them are discordant and of doubtful significance. The pure thermodynamic equation

$$p + \left(\frac{\partial E}{\partial v}\right)_T = T\left(\frac{\partial p}{\partial T}\right)_v$$

is free from these objections, and since $(\partial p/\partial T)_v = \alpha/\beta$, the expansion divided by the compressibility, the internal pressure may be calculated from the expression $T\alpha/\beta$ (Dupré (1)).

If the laws of molecular attraction were definitely known we could calculate $(\partial E/\partial V)_T$ from the heat of vaporization, $L$, and from the molecular surface energy, $E_\sigma$. As it is, we can conclude that internal pressures are roughly proportional to $(L - RT)/v$, and to $E_\sigma/v^{1/3}$, where $v$ is the molal volume of the liquid (*cf.* Dupré, (2) Stefan, (8) and Hildebrand (3)).

Laplace (5) has given expressions connecting the intermolecular attraction, on the one hand, with the force parallel to the surface, *i.e.*, the surface tension, $\gamma$, and, on the other hand, with the force normal to the surface, which may be called internal pressure. If an inverse power law of molecular attraction is assumed this makes internal pressure proportional to $\gamma/v^{1/3}$.

Relative internal pressures have been estimated by Mortimer (7) from a consideration of solubility data.

A critical discussion of the methods for calculating internal pressure, together with its relation to solubility, is given in Hildebrand (4, 11); *see also* Lewis (6); Richards (10).

Since the various methods for calculating internal pressure differ greatly as to magnitude but agree rather well as to relative values, a brief illustrative table is given below in which the values for certain liquids (marked*) have been calculated from the relation $T\alpha/\beta$. The values for the others have been estimated from the relative figures obtained by other methods.

Polar liquids have been omitted because the different methods give highly discordant results.

Internal Pressures of Liquids

| | Atm. | | Atm. |
|---|---|---|---|
| Octane* | 2 900 | Ethylene bromide* | 4 700 |
| Ethyl ether | 3 100 | Carbon disulfide | 5 400 |
| Stannic chloride | 3 400 | Bromoform* | 5 600 |
| *m*-Xylene* | 3 640 | Bromine | 6 000 |
| Carbon tetrachloride* | 3 640 | Sulfur monochloride | 6 100 |
| Toluene* | 3 780 | Sulfur | 8 000 |
| Chloroform* | 3 830 | Iodine | 8 000 |
| Benzene* | 4 050 | Phosphorus | 9 000 |
| Naphthalene | 4 400 | Mercury* | 13 050 |
| Iodobenzene | 4 600 | | |

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(For a key to the periodicals see end of volume)

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(10) Richards, *286*, **2**: 315; 26. (11) Westwater, Frantz and Hildebrand, *2*, **31**: 135; 28.

# MECHANICAL AND THERMAL PROPERTIES OF THE VARIOUS FORMS OF SILICA

Robert B. Sosman

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## CRYSTALLOGRAPHIC SYMMETRY

| Symmetry system | Symmetry class | | |
|---|---|---|---|
| | Schoenflies | Dana | Groth |
| **Low-quartz** | | | |
| Hexagonal; rhombohedral (or trigonal) subdivision | Trigonal enantiomorphous hemihedral, $D_3$ | Rhombohedral | Trigonal trapezohedral |
| **High-quartz** | | | |
| Hexagonal; hexagonal subdivision | Hexagonal enantiomorphous hemihedral, $D_6$ | | Hexagonal trapezohedral |
| **Low-tridymite** | | | |
| Orthorhombic | | | |
| **Lower high-tridymite** | | | |
| Hexagonal | (A hemihedral class?) | | |
| **Upper high-tridymite** | | | |
| Hexagonal | (A holohedral class?) | | |
| **Low-cristobalite** | | | |
| Either tetragonal or orthorhombic | | | |
| **High-cristobalite** | | | |
| Isometric | | | |

## INVERSION POINTS

### High-low Inversion Point of Quartz

| Property studied | Form of specimen | Inversion point, °C rising temp. | Lit. |
|---|---|---|---|
| Linear therm. expans. | Bars 5 × 5 × 110 mm | *ca.* 570 | (37) |
| Rotatory power | Plate 10 × 10 × 3 mm | *ca.* 570 | (38) |
| Birefringence | Plates | 575 | (80) |
| Birefringence | Plates | 570 | (46) |
| Refractive index | Crystals | 571 | (56) |
| Latent heat | Powder | 575 | (25, 26) |
| Latent heat | Plates | 573 | (5) |
| Young's modulus | Plates | 576 | (50) |

### Inversion Points of Cristobalite

| Source | Property studied | °C Rising | °C Falling | Lit. |
|---|---|---|---|---|
| Natural, Mexico | Birefringence | 175 | 175 | (45) |
| Agate (?) at 1500° | Dilatation | 210 | | (39) |
| Spherulites in glass | Birefringence | *ca.* 225 | | (66) |
| | Latent heat | 220 (min) | 198 (min) | (25, 26) |
| | Latent heat | 230 | | (22) |
| Dinas brick | Latent heat | | 226–229 | (21) |
| Dinas brick | | | 228 | (54) |
| Norway quartz | Volume | 210–245* | 220–200† | (54) |
| Flint | Volume | 228–230* | 229–226† | (54) |
| Amorphous $SiO_2$ | Volume | 215–250* | 217–208† | (54) |
| Vein quartz | Volume | | 223–205† | (54) |
| Vitreous $SiO_2$ at 1500°, 1 hr | Cracking (milkiness) | | 229 | (54) |
| Basalt, Blaue Kuppe | Not stated | 235–250 | 215–230 | (51) |
| Pptd. $SiO_2$, 1600° | Heat capacity | 270 | 230 | (78) |
| Pptd. $SiO_2$, 1100° | Heat capacity | 230 | 200 | (78) |
| Chalcedony, 1450° | Latent heat | | 220 | (77) |
| Flint, 1450° | Latent heat | | 227 | (77) |
| Purif. flint, 1500° | Latent heat | | 244 | (77) |

* Temperature of dilatometer probably higher than specimen.
† Temperature of dilatometer probably lower than specimen.

## DENSITY

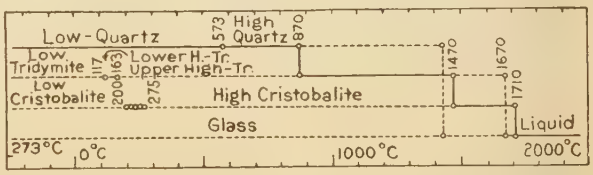
### Density at 0°C

| Modification | $d$, g/cm³ | ± | Lit. |
|---|---|---|---|
| Low-quartz | 2.6506 | 0.0005 | (32, 43, 47, 48, 69, 70) |
| Low-tridymite | 2.26 | 0.01 | (15, 25, 26, 77) |
| Low-cristobalite | 2.32 | 0.01 | (16, 25, 26, 77) |
| Vitreous silica | 2.203 | 0.002 | (14, 71, 72) |

### The Density of Tridymite

It is doubtful whether the density of low-tridymite can be obtained with high accuracy by the method of liquid immersion, since each crystal is finely twinned as a result of the high-low inversions, and minute interspaces may exist which are not accessible to the immersion liquid. Their effect, however, should not exceed a small fraction of one per cent.

| Source | °C | $d$, g/cm³ | Lit. |
|---|---|---|---|
| | 27 | 2.262 | (25, 26) |
| Purified flint and $Na_2WO_4$ at 1300° | 25 | 2.264 | (77) |
| Quartz in NaCl melt | 14.1 | 2.285 | (15) |
| | 15.5 | 2.284 | |




Ranges of stability and metastability of the modifications of silica (67).

### Cristobalite of Normal Density

| Source | °C | $d$, g/cm³ | Lit. |
|---|---|---|---|
| | 27 | 2.325 | (25, 26) |
| Quartz, 3 days at 1200° | 25 | 2.320 | (16) |
| Quartz, 6 days at 1160° | 25 | 2.319 | (16) |
| Vitreous $SiO_2$, 3 days at 1200° | 25 | 2.310 | (16) |
| Vitreous $SiO_2$, 6 days at 1160° | 25 | 2.311 | (16) |
| Purified flint and $Na_2WO_4$ at 1500° | 25 | 2.324 | (77) |

### Density-Temperature Table

The figures in small type have relative significance only

| $t$, °C | Quartz | Tridymite | Cristobalite | Vitreous |
|---|---|---|---|---|
| −250 | 2.665 | | | 2.203 |
| −200 | 2.664 | | | 2.203 |
| −150 | 2.662 | | | |
| −100 | 2.659 | | | 2.203 |
| − 50 | 2.655 | | | |
| 0 | 2.651 | $2.26_2$ | $2.32_0$ | 2.203 |
| + 50 | 2.646 | $2.25_5$ | $2.31_7$ | |
| 100 | 2.641 | $2.24_9$ | $2.31_3$ | 2.203 |
| 117 | | $2.24_7$ | | |
| | | $2.24_2$ | | |
| 150 | 2.636 | $2.23_5$ | $2.30_5$ | |
| 163 | | $2.23_3$ | | |
| | | $2.22_8$ | | |
| 200 | 2.630 | $2.22_1$ | $2.29_2$ | 2.202 |
| 250 | 2.623 | $2.21_4$ | $2.22_9$ | |
| 300 | 2.616 | $2.20_9$ | $2.22_2$ | 2.202 |
| 350 | 2.609 | | | |
| 400 | 2.601 | $2.20_1$ | $2.21_2$ | 2.202 |
| 450 | 2.591 | | | |
| 500 | 2.581 | $2.19_5$ | $2.20_8$ | 2.201 |
| 550 | 2.564 | | | |

| $t$, °C | Quartz | Tridymite | Cristobalite | Vitreous |
|---|---|---|---|---|
| 573 | 2.554<br>2.533 | | | |
| 600 | 2.533 | 2.192 | 2.203 | 2.201 |
| 700 | 2.534 | 2.189 | | 2.201 |
| 800 | 2.535 | 2.189 | | 2.200 |
| 900 | 2.537 | 2.189 | | 2.200 |
| 1000 | 2.541 | 2.190 | | 2.200 |
| 1100 | 2.543 | | | 2.199 |
| 1200 | 2.546 | | | |

## THERMAL EXPANSION

$\alpha = \frac{10^6}{v}\frac{dv}{dt}$ at $t$°C; $\alpha_m = \frac{10^6}{v_o}\frac{\Delta v}{t}$ where $\Delta v$ = expansion in volume between 0° and $t$°C (6, 10, 13, 14, 17, 18, 19, 20, 31, 34, 36, 37, 39, 41, 42, 49, 52, 53, 57, 58, 59, 60, 61, 62, 68, 79)

| $t$, °C | Quartz | | Tridymite | | Cristobalite | | Vitreous | |
|---|---|---|---|---|---|---|---|---|
| | $\alpha$ | $\alpha_m$ | $\alpha$ | $\alpha_m$ | $\alpha$ | $\alpha_m$ | $\alpha$ | $\alpha_m$ |
| −250 | | 21.3 | | | | | | −1.05 |
| −200 | 12 | 24.6 | | | | | −2.6 | −0.6 |
| −150 | 19 | 27.35 | | | | | | −0.1 |
| −100 | 25.2 | 29.7 | | | | | −0.9 | +0.4 |
| − 50 | 29.8 | 31.73 | | | | | | 0.75 |
| 0 | 33.6 | 33.58 | 73 | 73 | 17 | 17 | +1.1 | 1.15 |
| + 50 | 36.8 | 35.29 | 61 | 69 | 29 | 21 | 1.5 | 1.3 |
| 100 | 40.0 | 36.91 | 49 | 62 | 56 | 31 | 1.7 | 1.45 |
| 117 | | | | 60<br>77 | | | | |
| 150 | 43.3 | 38.50 | 89 | 81 | 81 | 44 | 1.7 | 1.55 |
| 163 | | | | 81<br>94 | | | | |
| 200 | 46.6 | 40.07 | 72 | 92 | 180 | 62 | 1.7 | 1.6 |
| 250 | 50.4 | 41.75 | 55 | 87 | 80 | 163 | 1.8 | |
| 300 | 54.9 | 43.55 | 45 | 81 | 58 | 147 | 1.8 | 1.67 |
| 350 | | 45.6 | | | | | | |
| 400 | 67.4 | 48.0 | 31 | 70 | 35 | 121 | 1.8 | 1.70 |
| 450 | | 50.8 | | | | | | |
| 500 | 100 | 54.5 | 21 | 62 | 22 | 103 | 1.7 | 1.70 |
| 550 | 141 | 61.3 | | | | | | |
| 573 | | 66.1<br>81.2 | | | | | | |
| 600 | 0 | 77.6 | +12 | 54 | 13 | 89 | 1.6 | 1.68 |
| 700 | | 65.8 | | | | | | |
| 800 | − 4 | 57.2 | 0 | 42 | | | 1.5 | 1.62 |
| 900 | | 49.4 | | | | | | |
| 1000 | −12 | 43.4 | − 7 | 33 | | | 1.9 | 1.62 |
| 1100 | | 38.3 | | | | | | |
| 1200 | | 34.1 | | | | | | |

## VOLUME CHANGE ON INVERSION

| Inversion | $t_{Tr}$, °C | Volume increase | | Lit. |
|---|---|---|---|---|
| | | cm³/kg | % of $v_o$ | |
| Low- to high-quartz | 573 | 3.25 | 0.86 | (10, 17, 36, 38) |
| Low- to lower high-tridymite | 117 | 0.63 | 0.14 | (10, 77) |
| Lower high- to upper high-tridymite | 163 | *ca.* 1 | *ca.* 0.2 | (10, 77) |
| Low- to high-cristobalite | 200 to 275 | 12 | 2.8 | (10, 77) |

## THERMAL CONDUCTIVITY (23, 24, 29, 74); *cf.* (81)

Unit, $cal_{20}\ cm^{-2}\ sec^{-1}\ (°C\ cm^{-1})\times 10^3 K$

| $t$, °C | Quartz ∥ to axis | Quartz ⊥ to axis | Vitreous silica | $t$, °C | Quartz ∥ to axis | Quartz ⊥ to axis | Vitreous silica |
|---|---|---|---|---|---|---|---|
| −252 | | 680 | | −100 | 52 | 26 | 2.5 |
| −250 | | 510 | *ca.* 1.3 | − 50 | 40 | 20.5 | 3.0 |
| −240 | | 205 | | 0 | 32 | 17.0 | 3.4 |
| −200 | *ca.* 150 | 66 | 1.5 | + 50 | 25.5 | 14.9 | 3.8 |
| −150 | 74 | 36 | 2.0 | 100 | 21 | 13.1 | *ca.* 4.5 |

## ELASTIC PROPERTIES

ELASTIC CONSTANTS OF VITREOUS SILICA AT ROOM TEMPERATURE

The unit is the kilomegabarye (= $10^9$ dyne/cm²). These are not theoretically consistent, but represent independent estimates from available data for each constant.

| Constant | Values | | Lit. |
|---|---|---|---|
| | Best | Range | |
| Modulus of compression | 370 | 317–474 | (11, 33, 44, 63, 65) |
| Rigidity | 305 | 146–308 | (3, 9, 30, 33, 35, 63, 65, 72, 73) |
| Young's modulus | 700 | 400–711 | (9, 33, 40, 65, 72) |
| Modulus of penetration | 690 | | (2) |
| Poisson's ratio | 0.14 | 0.13–0.31 | (9, 33, 63, 65, 72) |

"PRINCIPAL ELASTIC CONSTANTS" OF LOW-QUARTZ AT ROOM TEMPERATURE

Unit of stress is the kilomegabarye (= $10^9$ dyne/cm²) (50, 75)

| Principal elastic coefficients | Principal elastic moduli |
|---|---|
| $s_{11}$ 1298 × $10^{-6}$ | $c_{11}$ 851 |
| $s_{33}$ 990 × $10^{-6}$ | $c_{33}$ 1053 |
| $s_{44}$ 2005 × $10^{-6}$ | $c_{44}$ 571 |
| $s_{12}$ − 166 × $10^{-6}$ | $c_{12}$ 69 |
| $s_{13}$ − 152 × $10^{-6}$ | $c_{13}$ 140 |
| $s_{14}$ − 431 × $10^{-6}$ | $c_{14}$ 168 |

ELASTIC CONSTANTS OF LOW-QUARTZ AT ROOM TEMPERATURE, DERIVED FROM THE ABOVE DATA

Unit of stress is the kilomegabarye (= $10^9$ dyne/cm²)

| | |
|---|---|
| Volume compressibility | 2646 × $10^{-6}$ |
| Linear compressibility parallel to axis | 686 × $10^{-6}$ |
| Linear compressibility perpendicular to axis | 980 × $10^{-6}$ |
| Young's modulus parallel to axis | 1010 |
| Young's modulus perpendicular to axis | 770 |

MEAN COEFFICIENT OF COMPRESSIBILITY OF FORMS OF SILICA, AT ABOUT 20°C

$\beta_m = \frac{1}{v_o}\cdot\frac{v_o - v}{p}$; volume at pressure $p$ = volume at zero pressure × $(1 - \beta_m p)$ (1, 4, 11, 12, 44, 63)

| $p$ (megabarye) | | 0 | 2 000 | 4 000 | 6 000 | 8 000 | 10 000 | 12 000 |
|---|---|---|---|---|---|---|---|---|
| $10^6\beta_m$ | Quartz | 2.76 | 2.71 | 2.65 | 2.59 | 2.54 | 2.49 | 2.44 |
| | Vitreous | 2.68 | 2.72 | 2.76 | 2.80 | 2.84 | 2.88 | 2.92 |

## STRENGTH

STRENGTH OF QUARTZ AND OF VITREOUS SILICA AT ROOM TEMPERATURE

Unit of stress is the kilomegabarye (= $10^9$ dyne/cm²) (7, 8, 55, 64, 76)

| | Quartz ∥ to axis | Quartz ⊥ to axis | Vitreous silica |
|---|---|---|---|
| Crushing strength | | | |
| Typical for small specimens | 24 | 22 | 19.5 |
| Maximum observed | 27.2 | 26.85 | 22.6 |

| | Quartz | | Vitreous silica |
|---|---|---|---|
| | ∥ to axis | ⊥ to axis | |
| **Tensile strength** | | | |
| Typical for carefully centered small specimens | 1.1 | 0.83 | 3 to 8 |
| Maximum observed | 1.19 | 0.91 | 11.5 |
| **Modulus of rupture (bending strength)** | | | |
| Typical | 1.35 | 0.90 | |
| Maximum observed | 1.76 | 1.30 | 0.675 |

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(For a key to the periodicals see end of volume)


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# FREEZING-POINT—SOLUBILITY DATA: SYSTEMS CONTAINING A NON-METALLIC ELEMENT AS ONE COMPONENT[1]

C. Tourneux


INDEX

Abbreviations and symbols.

Two-component systems

Sec. 1. Both A- and B-components are elementary substances.

Sec. 2. The A-components are elementary substances; the B-components are compounds whose key-formulae do not begin with 16.

Sec. 3. The A-components are elementary substances; the B-components are compounds whose key-formulae begin with 16.

Sec. 4. Cryoscopic data.

Three-component systems.


Precision in $t°$ or Mol % is indicated as the greatest deviation of an observed value from either a tabular value or the value given on a curve drawn through the plotted original data.


MATIÈRES

Abréviations et symbols.

Systèmes à deux constituants

Sec. 1. Les deux constituants A et B sont des substances élémentaires.

Sec. 2. Les constituants A sont des substances élémentaires; les constituants B sont des composés dont la formule clé ne commence pas par 16.

Sec. 3. Les constituants A sont des substances élémentaires; les constituants B sont des composés dont la formule clé commence par 16.

Sec. 4. Données cryoscopiques. Systèmes à trois constituants.


La précision en $t°$ ou en % Mol est indiquée comme étant le plus grand écart entre une valeur observée et la valeur tabulaire ou la valeur donnée sur une courbe de sentiment tracée à partir des données originales.


INHALTSVERZEICHNIS

Abkürzungen und Verzeichen.

Zwei-Komponenten Systeme

Abtlg. 1. Beide Komponenten (A und B) sind elementare Stoffe.

Abtlg. 2. Die A-Komponente ist ein elementarer Stoff; die B-Komponente ist eine Verbindung, deren Schlüsselzahl nicht mit 16 beginnt.

Abtlg. 3. Die A-Komponente ist ein elementarer Stoff; die B-Komponente ist eine Verbindung deren Schlüsselzahl mit 16 beginnt.

Abtlg. 4. Kryoskopische Daten. Drei-Komponenten Systeme.


Die Präzision in $t°$ oder Mol % ist durch die grösste Abweichung eines experimentell bestimmten Wertes gekennzeichnet, die sich entweder aus den Werten der Tabelle oder aus denen der Kurve ergibt, die durch die Original-Werte gelegt worden ist.


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Il grado di precisione delle $t°$ e dei Mol % è rappresentato dalla massima deviazione di un valore osservato o dal valore della tabella o dal valore dato da una curva tracciata con i dati originari.

[1] Except: (a) Freezing-point lowerings of aqueous solutions, for which *v.* p. 254, and (b) some two-component systems containing iron as one component, for which *v.* Vol. II, p. 449.

## TWO-COMPONENT SYSTEMS

**Sec. 1. Both A- and B-components are Elementary Substances**

Standard arrangement (*v.* Vol. III, p. viii)

### O

B = V (153)

| °C | M % A |
|---|---|
| | B |
| **1715** | **0** |
| | $B_2A_3$(?) |
| 1734 | 7.3 |
| 1828 | 36.0 |
| 1935 | 51.0 |
| 2000 | 58.5 |

### Cl

B = Br (95)

| °C ±2 | M % A ±4 Mix. | Liq. |
|---|---|---|
| **− 7.3*** | **0** | |
| − 11.0 | 2 | 5 |
| − 14.5 | 4 | 10 |
| − 22.5 | 9 | 20 |
| − 31.5 | 16 | 30 |
| − 42.0 | 25 | 40 |
| − 54.0 | 34 | 50 |
| − 62.5 | 43 | 60 |
| − 71.5 | 52 | 70 |
| − 80.0 | 63 | 80 |
| − 90.0 | 76 | 90 |
| − 98.0 | 86 | 95 |
| **−102.0** | **100** | |

*±0.2.

B = I (159, 160)

| °C ±1 | M % A |
|---|---|
| | B |
| **114.5** | **0** |
| 99.5 | 10 |
| **77.0** | 20 |
| 45.0 | 30 |
| 4m | 41 |
| | B + $BA(\alpha)$ |
| 8E | 40 |
| | B + $BA(\beta)$ |
| 1mE | 42 |
| | $BA(\alpha)$ |
| 18.5 | 45.0 |
| **27.5** | **50.0** |
| | $BA(\beta)$ |
| 6m | 45 |
| **14**m | 50.0 |
| | $BA(\alpha) + BA_3$ |
| 22E | 54.4 |
| | $BA(\beta) + BA_3$ |
| **12**mE | **52.5** |
| | $BA_3$ |
| 20.5m | 54 |
| 55.0 | 60.0 |
| 83.0 | 65.0 |
| 95.0 | 70.0 |
| **101.0** | **75.0** |
| 96.0 | 90.0 |
| + 30.0 | 99.9 |
| | $BA_3$ + A |
| −102E | (?) |
| | A |
| **−101.5** | **100** |

B = S (10, 150)

| °C ±1 | M % B |
|---|---|
| | A |
| **−102** | **0** |
| | $A_xB$ |
| − 38 | 8.2 |
| | $A_xB + A_4B$ |
| − 39E | 9.86 |
| | $A_4B$ |
| − 32 | 15.0 |
| − **30.5** | **20.0** |
| − 35.5 | 25.0 |
| − 66.5 | 35.0 |
| | $A_4B + A_2B_2$ |
| −101.5E | 42.5 |
| | $A_2B_2$ |
| − 85.0 | 48.0 |
| − **80.0** | **50.0** |
| | $A_2B_2$ + B |
| − 83.0E | 52.0 |
| | B(rh)* |
| − 5.0 | 55.0 |
| + 37.5 | 65 |
| 60.0 | 75 |
| 76.0 | 85 |
| | B(rh) + B(mon) |
| 95.6U | 95 |
| | B(mon) |
| **118.8** | **100** |

*rh = Rhombic; mon = Monoclinic.

B = Te (46)

| °C ±2 | M % B ±0.5 | |
|---|---|---|
| | $BA_4$ | |
| **223** | **20.0** | |
| | $Mix_1$ | |
| 213 | 20.6 | 22.5 |
| 204.5 | 21.2 | 27.5 |
| | $Mix_1 + Mix_2$ | |
| 202.5E | 21.4 | 30.0 |
| | 39.5 | 30.0 |
| | $Mix_2$ | |
| 218 ↓ | 43.2 | 35.0 |
| 233 ↓ | 46.7 | 40.0 |
| | $Mix_2$ + B | |
| 238.5U | 48.0 | 41.5 |
| | B | |
| 252.5 | 50.0 | |
| 275.5 | 60.0 | |
| 294.0 | 65.0 | |
| 332 | 70.0 | |
| 388 | 80.0 | |
| 426 | 90.0 | |
| **453** | **100.0** | |

$TeCl_4$ is very slightly soluble in liq. $Cl_2$.

B = Bi (50)

| °C ±2 | M % B |
|---|---|
| | $A_4B$ |
| 206 | 14.2 |
| **226** | **20.0** |
| 221 | 20.8 |

B = Bi.—(*Continued*)

| °C ±2 | M % B |
|---|---|
| | $A_4B + A_3B$ |
| 206E | 21.5 |
| | $A_3B$ |
| 220 | 22.4 |
| **232** | **25.0** |
| 225 | 26.5 |
| | $A_3B$ + AB |
| 209E | 27.5 |
| | AB |
| 280 | 30.0 |
| 318* | 38.0 |
| 318* | 85.5 |
| 303 | 89.5 |
| 283 | 93 |
| | AB + B |
| 267.5E | 94.5 |
| | B |
| **271.5** | **100** |

*Two liq. layers with the following compositions:

| $t_s$ | M % B | |
|---|---|---|
| 328 | 34 | |
| 332 | | 83.8 |
| 334 | 32 | |
| 340 | | 82.5 |

### Br

B = I (161)

| °C | M % B ±1.0 | |
|---|---|---|
| | A | |
| **− 7.3** | **0** | |
| | $Mix_1$ | |
| − 6.1 | 10 | 5 |
| − 2.8 | 18 | 10 |
| + 2.5 | (24) | 15 |
| 13.8 | (33) | 25 |
| 31.0 | 43 | 40 |
| | AB | |
| **41.0** | **50.0** | |
| | $Mix_2$ | |
| 46.0 | 58 | 55 |
| 52 | (66) | 60 |
| 83.7 | 85 | 80 |
| 99.0 | 93 | 90 |
| | B | |
| **110.6** | **100** | |
| | Mix. | |
| 19 | 32.5 | |
| 36 | 47.1 | |
| 40.4 | 50 | |
| 49 | 60.4 | |
| 100 | 92.9 | |

B = S (154)

| °C ±1 | M % B |
|---|---|
| | A |
| **− 7.3** | **0** |
| −10.0 | 10.0 |
| −16.0 | 20.0 |
| −23.0 | 25.0 |
| −38.5 | 30.0 |
| −47.5 | 35.0 |
| | $A_2 + A_2B_2$ |
| −52.0E | 38.5 |

B = S.—(*Continued*)

| °C ±1 | M % B |
|---|---|
| | $A_2B_2$ |
| −50.5 | 40.0 |
| −45.5 | 45.0 |
| **−39.5** | **50.0** |

B = Te (46)

| °C ±1 | M % B | |
|---|---|---|
| | $A_4B$ | |
| **363** | **20.0** | |
| | $Mix_1$ | |
| 322 | 22.4 | 25.0 |
| 290 | 24.2 | 30.0 |
| 264 | 25.9 | 35.0 |
| 223 | 27.2 | 45.0 |
| | $Mix_1 + Mix_2$ | |
| 200E | 29.5 | 52.5 |
| | 61.0 | 52.5 |
| | $Mix_2$ | |
| 211 | 62.7 | 55.0 |
| | $Mix_2$ + B | |
| 225U | 64.5 | 60.1 |
| | B | |
| 247 | 65.0 | |
| 290 | 70.0 | |
| 335 | 75.0 | |
| 394 | 85.0 | |
| 436 | 95.0 | |
| **453** | **100.0** | |

$TeBr_4$ is very slightly soluble in $Br_2$.

B = Bi (50)

| °C ±2 | M % B |
|---|---|
| | $A_3B$ |
| **218** | **25.0** |
| 214.5 | 27.0 |
| | $A_3B$ + AB |
| 205E | 29.2 |
| | AB |
| 242 | 31.5 |
| 267 | 35.0 |
| 285* | 38.0 |
| 285* | 80.5 |
| 273 | 89.3 |
| | AB + B |
| 261E | 94.6 |
| | B |
| 266.5 | 97.0 |
| **271.5** | **100** |

*Two liq. layers of following compositions:

| $t_s$ | M % B | |
|---|---|---|
| 297 | 39.8 | |
| 299 | | 84.5 |
| 306 | 41.1 | |
| 311 | | 87.7 |

### I

B = S (28, 51, 120, 157)

| °C ±1 | M % B |
|---|---|
| | A |
| **114.0** | **0** |
| 111.2 | 10.0 |
| 108.0 | 20.0 |
| 104.7 | 30.6 |
| 101.5 | 40.0 |

## I.—(*Continued*)

B = S.—(*Continued*)

| °C ±1 | M % B |
|---|---|
| A | |
| 96.0 | 50.0 |
| 89.4 | 60.0 |
| 79.5 | 70.0 |
| A + B* | |
| 65.7E | 80.5 |
| B* | |
| 71.5 | 85.0 |
| 81.5 | 90.0 |
| 96.0 | 95.0 |
| **119.0** | **100.0** |

* Monoclinic.

B = Se [17, 137]

| °C ±2 | M % B |
|---|---|
| A | |
| **113** | **0** |
| 100 | 10 |
| 89 | 20 |
| 80 | 30 |
| 70 | 40 |
| A + B | |
| 58E | 50 |
| B | |
| 93 | 60 |
| 124.5 | 70 |
| 157 | 80 |
| 190 | 90 |
| **218.5** | **100** |

B = Te [46]

| °C ±1 | M % B |
|---|---|
| A | |
| **114.2** | **0** |
| A + $A_4B$ | |
| 113.5E | 0.5 |
| $A_4B$ | |
| **280** | **20.0** |
| 235 | 30.0 |
| 188 | 37.5 |
| $A_4B$ + Mix. | |
| 176.3E | 45.0 \| 41.0 |
| Mix. | |
| 177.5 | 45.5 \| 42.0 |
| 182 | 47.0 \| 45.0 |
| Mix. + B | |
| 183.5U | 47.5 \| 45.3 |
| B | |
| 191 | 50.0 |
| 203 | 54.0 |
| 235 | 57.5 |
| 256 | 60.0 |
| 279 | 65.0 |
| 298 | 70.0 |
| 355 | 77.5 |
| **453** | **100.0** |

B = As [48, 142, 143]

| °C* | M % B |
|---|---|
| A | |
| **113.5** | **0** |
| 103.5 | 5.0 |
| 88.5 | 10.0 |
| A + $A_3B$ | |
| 72.0E | 14.0 |

B = As.—(*Continued*)

| °C* | M % B |
|---|---|
| $A_3B$ | |
| 106 | 20.0 |
| 121 | 22.5 |
| **140.5** | **25.0** |
| 129 | 27.5 |
| $A_3B$ + $A_4B_3$ | |
| 121.5E | 28.5 |
| $A_4B_3$ | |
| 131 | 30.0 |
| 135† | 30.1 |
| 135† | 70.0 |
| 128 | 78.0 |
| $A_4B_3$ + B | |
| 119E | 81.0 |
| B | |
| (500) | 100 |

* ±1 (0–14 M % B); ±4 (14–81 M % B).
† Two liq. layers.

B = Sb [48, 142]

| °C* | M % B |
|---|---|
| A | |
| **114** | **0** |
| 103.0 | 5.0 |
| 88.0 | 10.0 |
| A + $BA_3$ | |
| 80.0E | 11.7 |
| $BA_3$ | |
| 96.0 | 15.0 |
| 132 | 20.0 |
| **171** | **25.0** |
| 169† | 25–30 |
| 169† | 71.6 |
| 168.2 | 80.0 |
| 167.5 | 90.0 |
| $BA_3$ + B | |
| (?)E | (?) |
| B | |
| **632** | **100** |

* ±0.5 (0–12 M % B); ±2 (12–25 M % B); ±1 (25–90 M % B).
† Two liq. layers.

B = Bi [98, 110]

| °C ±5 | M % B |
|---|---|
| A | |
| **113.5** | **0** |
| A + $A_3B$ | |
| 113E | 6 |
| $A_3B$ | |
| 300 | 7 |
| 400 | 20.0 |
| **410** | **25.0** |
| 385 | 30.0 |
| 340* | 39.0 |
| 340* | 96.5 |
| $A_3B$ + AB | |
| 281U | 98.0 |
| AB + B | |
| 270E | 99.0 |
| B | |
| **272** | **100** |

* Two liq. layers.

B = Sn [98, 145, 146, 169]

| °C ±1 | M % B |
|---|---|
| A | |
| **113.2** | **0** |
| 103.0 | 5.0 |
| 87.5 | 10.0 |
| A + $BA_4$ | |
| 79.0E | 12.0 |
| $BA_4$ | |
| 89.8 | 14.0 |
| 108.5 | 16.0 |
| 127 | 18.0 |
| $BA_4$ + $BA_2$ | |
| **143U** | **20.0** |

B = In [162]

| °C ±2 | M % A |
|---|---|
| BA | |
| **350** | **50** |
| 340 | 55 |
| 304 | 60 |
| 224 | 65 |
| BA + $BA_2$ | |
| 204E | 65.8 |
| $BA_2$ | |
| 207 | 66.0 |
| 211 | 66.4 |
| **212** | **66.7** |
| 196 | 68.0 |
| 174 | 69.0 |
| $BA_2$ + $BA_3$ | |
| 142E | 70.0 |
| $BA_3$ | |
| 162 | 72.0 |
| 190 | 74.0 |
| **200** | **75.0** |

*ts* not detd., mixed crystals possible.

## S

B = Se [112]

| °C ±2 | M % B |
|---|---|
| $Mix_1$ | |
| **107** (?) | **0** |
| 110 | 5 |
| 110 | 10 |
| 107.5 | 15 |
| $Mix_1$ + $Mix_2$ | |
| 98E | 12 \| 20 |
| | 26 \| 20 |
| $Mix_2$ | |
| 105 | 45 \| 25 |
| 108 | 51 \| 30 |
| 110 | 54 \| 35 |
| 111 | 56 \| 45 |
| 114 | 60 \| 55 |
| $Mix_2$ + $Mix_3$ | |
| 116U | 62 \| 57 |
| | 64 \| 57 |
| $Mix_3$ | |
| 117 | 67 \| 60 |
| 122 | 73 \| 70 |
| 135 | 82 \| 80 |
| 160 | 91 \| 90 |
| **207** | **100** |

B = Se.—(*Continued*) [148]

| °C ±5 | M % B |
|---|---|
| $Mix_1$ | |
| **119** | **0** |
| 118 | 2.5 \| 10 |
| 115 | 9 \| 20 |
| 109 | 20 \| 30 |
| $Mix_1$ + $Mix_2$ | |
| 100E | 33 \| 40 |
| | 46 \| 40 |
| $Mix_2$ | |
| 125 | 58 \| 50 |
| 142 | 69 \| 60 |
| 155 | 79 \| 70 |
| $Mix_2$ + $Mix_3$ | |
| 160U | 83 \| 74 |
| | 87 \| 74 |
| $Mix_3$ | |
| 182 | 91 \| 80 |
| 202 | 96 \| 90 |
| **217.6** | **100** |

B = Te [34, 91]

| °C* | M % B |
|---|---|
| A | |
| **114** | **0** |
| $Mix_1$ + $Mix_2$ | |
| 108E† | 1 \| 2 |
| | 92 \| 2 |
| $Mix_2$ | |
| 198 | 5 |
| 258 | 94 \| 10 |
| 318 | 20 |
| 347 | 30 |
| 369 | 40 |
| 384 | 96 \| 50 |
| 396 | 60 |
| 408 | 70 |
| 420 | 97 \| 80 |
| 434 | 90 |
| 440 | 98.5 \| 95 |
| **453** | **100** |

* ±20 from 2–40 M % B; ±5 from 40–100 M % B. † ±2.

B = P [70]; *v.* Fig. 1

| °C ±1 | M % A |
|---|---|
| B | |
| **44** | **0** |
| 32 | 5 |
| 19 | 10 |
| + 6 | 15 |
| −18m | 25 |
| −31m | 30 |
| B + $AB_2$(?) | |
| − 6E | 20 |
| $AB_2$(?) | |
| +11 | 25 |
| 25 | 30 |
| $AB_2$(?) + $A_3B_4$ | |
| 40U | 35 |
| B + $A_3B_4$ | |
| −38mE | 33 |
| $A_3B_4$ | |
| +98 | 37.5 |
| 143 | 40 |
| **167** | **42.8** |

B = P.—(*Continued*)

| °C ±1 | M % A |
|---|---|
| $A_3B_4$ | |
| 154 | 45 |
| 105 | 47.5 |
| $A_3B_4 + A_3B_2$ | |
| 46E | 49.5 |
| $A_3B_2$ | |
| 210 | 55 |
| 280 | 57.5 |
| **296** | **60** |
| 290 | 62.5 |
| $A_3B_2 + A_5B_2$ | |
| 230E | 66.8 |
| $A_5B_2$ | |
| 266 | 70 |
| **272** | **71.4** |
| 268 | 73 |
| $A_5B_2 + A_6B$ | |
| 243E | 74.5 |
| $A_6B$ | |
| 295 | 80 |
| 312 | 82.5 |
| **314** | **85.6** |
| 309 | 90 |
| 250 | 95 |
| A | |
| **115** | **100** |

| °C ±1 | M % A (27, 29) | |
|---|---|---|
| $Mix_1$ | | |
| **44** | **0** | |
| 37m | 1 | 5 |
| +15m | 4.5 | 20 |
| um | 7 | 30 |
| −15m | 9.5 | 40 |
| $Mix_1 + Mix_2$ | | |
| 10mE | 10 | 23 |
| | 78.5 | 23 |
| $Mix_2$ | | |
| 23m | 81 | 30 |
| 38m | 84 | 40 |
| 52m | 87 | 50 |
| 65m | 90 | 60 |
| 78m | 92.5 | 70 |
| 90m | 95 | 80 |
| 102m | 97.5 | 90 |
| **115** | **100** | |

B = As (94)

B = Sb (75, 90, 132)

| °C ±3 | M % A |
|---|---|
| B | |
| **632** | **0** |
| 619 | 5.0 |
| 615*†§ | 6.5 |
| 615*†§ | 55.0 |
| $B + B_2A_3$ | |
| 520E‡§ | 57.5 |
| $B_2A_3$ | |
| 537 | 59.0 |
| **546** | **60.0** |
| 543 | 61.0 |
| 530 | 63.8 |

* Two liq. layers. ‡ 503° (75).
† 593° (75). § ±1.

B = Bi (9, 132)

| °C ±5 | M % A |
|---|---|
| B | |
| **277** | **0** |
| $B + A_3B_2(?)$ | |
| 270E* | 0.75 |
| $A_3B_2(?)$ | |
| 330 | 1 |
| 460 | 5 |
| 525 | 15 |
| 606 | 30 |
| 655 | 40 |
| 730 | 50 |
| 760 | 52.4 |

* ±2.

B = Sn (20, 132)

| °C ±3 | M % A |
|---|---|
| B | |
| **232** | **0** |
| B + BA | |
| (?)* | (?) |
| BA | |
| 853 | 11 |
| 855.5 | 20 |
| 857 | 30 |
| 858 | 40 |
| 860.5 | 44 |
| 869 | 48 |
| **880** | **50** |
| 836 | 53 |

* 230 to 241°.

B = Pb (62, 76)

| °C ±10 | M % A |
|---|---|
| B | |
| **327** | **0** |
| B + AB | |
| 327E* | (?) |
| AB | |
| 808 | 4 |
| 915 | 10 |
| 972 | 15 |
| 1010 | 20 |
| 1038 | 30 |
| 1045 | 40 |
| 1064 | 45 |
| **1103** | **50** |

* 325 to 329°.

B = Tl (132)

| °C | M % A |
|---|---|
| B | |
| **302** | **0** |
| $B_2A + (?)$ | |
| 448* | 0–33.3 |
| (?) | |
| 300 | 47 |
| $B_2A_5$ | |
| **127** | **71.4** |
| 127* | 71–100 |
| A | |
| **114** | **100** |

* Two liq. layers.

B = Zn (60)

No values obtainable due to vaporization of one or more of the components.

B = Cu (81, 167); *cf.* (65)

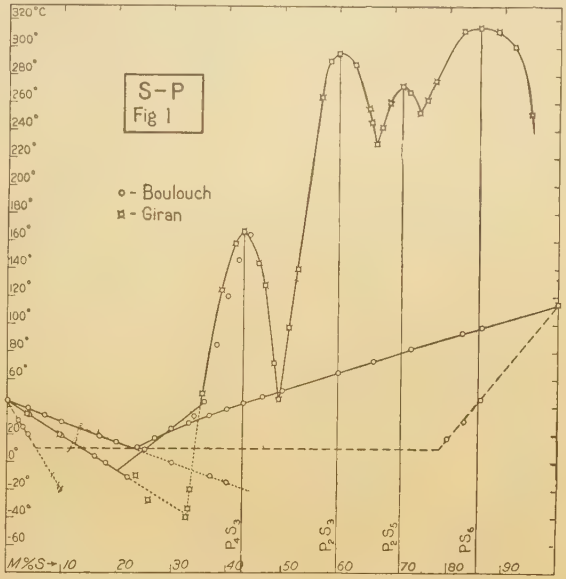
| °C ±2 (81) | °C ±2 (167) | M % A |
|---|---|---|
| B | | |
| **1084** | **1085** | **0** |
| 1078.5 | 1073.5 | 1 |
| $B + AB_2$ | | |
| 1070E | 1067E | 2 |
| $AB_2$ | | |
| 1121* | 1102* | 3.6 |
| 1121* | 1102* | 31.0 |
| 1131 | 1111 | 32 0 |
| 1149 | 1123 | 33.0 |
| **1153** | **1127** | **33.3** |

| °C ±2 (81) | °C ±2 (167) | M % A |
|---|---|---|
| $AB_2$ | | |
| 1138 | | 35.0 |
| 1119 | | 35.7 |

* Two liq. layers, of the following composition:

| °C | M % A | |
|---|---|---|
| | U | L |
| 1150 | 32.3 | 2.06 |
| 1200 | 32.0 | 3.41 |
| 1300 | 31.3 | 3.51 |
| 1425 | 31.1 | 7.08 |
| 1485 | 31.3 | 9.55 |

U = upper layer. L = lower layer




B = Ag (23, 63, 89, 167)

| °C ±5 | M % A |
|---|---|
| B | |
| **961** | **0** |
| 956 | 1.0 |
| 948 | 2.0 |
| 930 | 4.0 |
| 903* | 6.0† |
| 902* | 31.6 |
| 889 | 32 0 |
| $B + AB_2$ | |
| 865E | 32.5 |
| $AB_2$ | |
| **814** | **32.9** |

* Two liq. layers.
† ±0.5 %; ±3°.

B = Au or Pt (60)

No values obtainable due to vaporization of one or more of the components.

B = Co (59)

| °C ±5 | M % A |
|---|---|
| B(?)* | |
| **1494** | **0** |

B = Co.—(*Continued*)

| °C ±5 | M % A | |
|---|---|---|
| B(?)* | | |
| 1467 | 2 | |
| 1428 | 6 | |
| 1400 | 10 | |
| 1370 | 15 | |
| 1339 | 20 | |
| 1246 | 30 | |
| 1115 | 35 | |
| B* + Mix. | | |
| 876E | 41.3 | 40.2 |
| Mix. | | |
| 900 | | 41 |
| 920 | | 42 |
| Mix. + AB(?) | | |
| 936U | | 43.2 |
| AB(?) | | |
| 968 | | 44.0 |
| 1044 | | 46.0 |
| 1125 | | 48.0 |

Solid state transformations are also given.

* Or "Mix" with <1.8 M % A.

## S.—(*Continued*)

B = Ni (24, 25)

| °C ±2 | M % A |
|---|---|
| B* | |
| **1451** | **0** |
| 1400 | 5 |
| 1340 | 10 |
| 1272 | 15 |
| 1196 | 20 |
| 1105 | 25 |
| 918 | 30 |
| 765 | 32.5 |
| B + Mix. | |
| 644E | 37.3 \| 34.2 |
| $Mix_1$ | |
| 719 | 37.8 \| 36.0 |
| 772 | 39.0 \| 38 0 |
| $A_3B_2$ | |
| **787** | **40. 0** |
| $Mix_2$ | |
| 794 | 41.6 \| 40.5 |
| 798 | 44.1 \| 40.9 |
| 805 | 44.5 \| 41.5 |
| 810 | 44.6 \| 42.8 |
| $Mix_2 + A_5B_6$(?) | |
| 810U | 44.6 \| 44.2 |
| $A_5B_6$(?) | |
| 822 | 44.5 |
| 848 | 45.2 |

Solid state transformations are also given.

* Or "Mix." with <1 M % A.

B = Na (61)

| °C* | M % A† |
|---|---|
| $A_2B_4$ | |
| **920** | **33. 3** |
| 898 | 34.0 |
| 826 | 36.0 |
| 732 | 38.0 |
| $A_2B_4 + A_3B_4$ | |
| 665E‡ | 39.3 |
| $A_3B_4$ | |
| 720 | 40.0 |
| 755 | 41.0 |
| 770 | 42.0 |
| **772** | **42. 9** |
| 752 | 44.0 |
| 690 | 46.0 |
| 575 | 48.0 |
| 470 | 49.0 |
| $A_3B_4 + A_4B_4$ | |
| 440E‡ | 49.2 |
| $A_4B_4$ | |
| **445** | **50. 0** |
| 415 | 51.0 |
| 315 | 51.5 |
| $A_4B_4 + A_5B_4$ | |
| 250E‡ | 51.8 |
| $A_5B_4$ | |
| 264 | 52.0 |
| 308 | 53.0 |
| 330 | 54.6 |
| 342 | 55.0 |
| **345** | **55. 5** |
| 338 | 56.0 |
| 308 | 57.0 |

B = Na.—(*Continued*)

| °C* | M % A† |
|---|---|
| $A_5B_4 + A_6B_4$ | |
| 270E | 57.7 |
| $A_6B_4$ | |
| 280 | 58.0 |
| 315 | 59.0 |
| **320** | **60. 0** |
| 290 | 61.0 |
| 260 | 61.5 |
| $A_6B_4 + A_7B_4$ | |
| 220E | 61.8 |
| $A_7B_4$ | |
| 245 | 62.0 |
| 285 | 63.0 |
| **295** | **63. 6** |
| 265 | 64.5 |
| 232 | 65.0 |
| $A_7B_4 + A_8B_4$ | |
| 198E | 65.3 |
| $A_8B_4$ | |
| 225 | 65.6 |
| 240 | 66.0 |
| **255** | **66. 6** |
| 250 | 67.0 |
| 232 | 67.5 |
| 200 | 68.0 |
| $A_8B_4 + A_9B_4$ | |
| 168E‡ | 68.3 |
| $A_9B_4$ | |
| 200 | 68.7 |
| **210** | **69. 2** |
| 203 | 69.6 |
| 185 | 70.0 |
| $A_9B_4 + A_{10}B_4$ | |
| 155E‡ | 70.6 |
| $A_{10}B_4$ | |
| 180 | 71.0 |
| **185** | **71. 4** |

* °C ±5 at <400°; ±10 at >400°.
† ±0.1 M %.
‡ °C ±1 at <400°; ±2 at >400°.

B = Rb (22)

| °C ±2 | M % A |
|---|---|
| AB | |
| **420** | **50. 0** |
| 380 | 53.0 |
| 235 | 56.0 |
| 215 | 58.0 |
| 212* | 58.4 |
| 212* | 60.0 |
| $AB + A_3B_2$ | |
| 200U | 60.4 |
| $A_3B_2$ | |
| 185 | 62.0 |
| 166 | 64.0 |
| $A_3B_2 + A_4B_2$ | |
| 148.5E | 65.75 |
| $A_4B_2$ | |
| 153 | 66.0 |
| 158 | 66.5 |
| $A_4B_2 + A_5B_2$ | |
| 159.5U | 66.8 |
| $A_5B_2$ | |
| 198 | 68.0 |
| 220 | 69.0 |

B = Rb.—(*Continued*)

| °C ±2 | M % A |
|---|---|
| $A_5B_2$ | |
| 229 | 70.0 |
| **231** | **71. 4** |
| 222 | 73.0 |
| 204 | 75.0 |
| $A_5B_2 + A_6B_2$ | |
| 190U | 75.6 |
| $A_6B_2$ | |
| 185† | 76.1 |
| 185† | 77.3 |

The composition of the solid phases may not be exact, as mixed crystals may exist.

* Two liq. phases (?).
† Two liq. phases.

B = Cs (22)

| °C ±2 | M % A |
|---|---|
| $A_2B_2$ | |
| **460** | **50. 0** |
| 410 | 50.2 |
| 398 | 51.7 |
| 341 | 54.0 |
| $A_2B_2 + A_4B_2$ | |
| 151E | 64.0 |
| $A_4B_2$ | |
| 156.5 | 65.0 |
| 159.5 | 66.0 |
| **160** | **66. 7** |
| $A_4B_2 + A_5B_2$ | |
| 159.5E | 66.8 |
| $A_5B_2$ | |
| 183 | 67.5 |
| 204 | 69.0 |
| **209** | **71. 4** |
| 200.5 | 72.5 |
| 189.5 | 73.5 |
| $A_5B_2 + A_6B_2$ | |
| 178E | 74.0 |
| $A_6B_2$ | |
| 184 | 74.5 |
| **186** | **75. 0** |
| 183.5 | 75.5 |
| 175 | 76.0 |
| 172.8* | 76.1 |
| 172.8* | 77.7 |

The composition of the solid phases may not be exact, as mixed crystals may exist.

* Two liq. phases(?). From 55.2–57.6 M % A, $t_e$ = 205.5.

## Se

B = Te

| °C ±2 | M % A ±1 |
|---|---|
| Mix. (96) | |
| 441 | 0 |
| 427 | 1.2 \| 10 |
| 408 | 4 \| 20 |
| 386 | 7.2 \| 30 |
| 358 | 13.8 \| 40 |
| 333 | 20.5 \| 50 |
| 306 | 30.5 \| 60 |
| 275 | 44.2 \| 70 |
| 240 | 60.0 \| 80 |
| 220 | 68.2 \| 85 |

B = Te.—(*Continued*)

| °C ±2 | M % A ±1 |
|---|---|
| Mix. (96) | |
| 194 | 79.0 \| 90 |
| 156 | 91.0 \| 95 |
| 130 | 96.8 \| 96.8 |
| 184 | 98 \| 99 |
| **197** | **100** |
| Mix. (141) | |
| **450** | **0** |
| 442 | 10 |
| 423 | 20 |
| 399 | 30 |
| 373 | 40 |
| 346 | 50 |
| 317 | 56.5 \| 60 |
| 288 | 67 \| 70 |
| 260 | 76 \| 80 |
| 237 | 84 \| 90 |
| 226 | 89 \| 95 |
| **218** | **100** |

B = Sb (2, 37, 42, 43, 129, 132)

*See* Figs. 2 and 3.

Data of (2, 42, 43, 129) do not agree with the others.

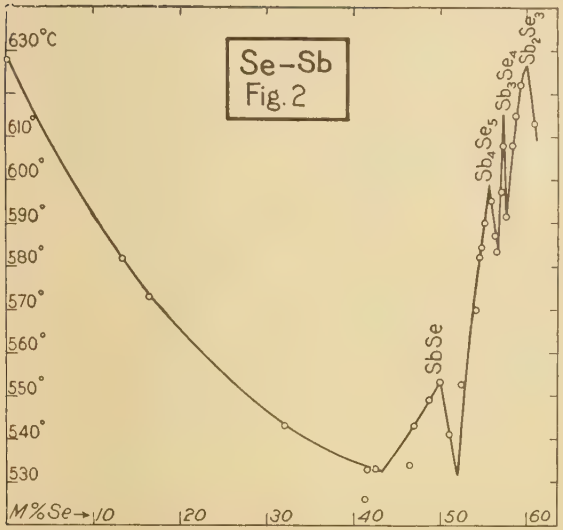
B = Bi (129, 164)

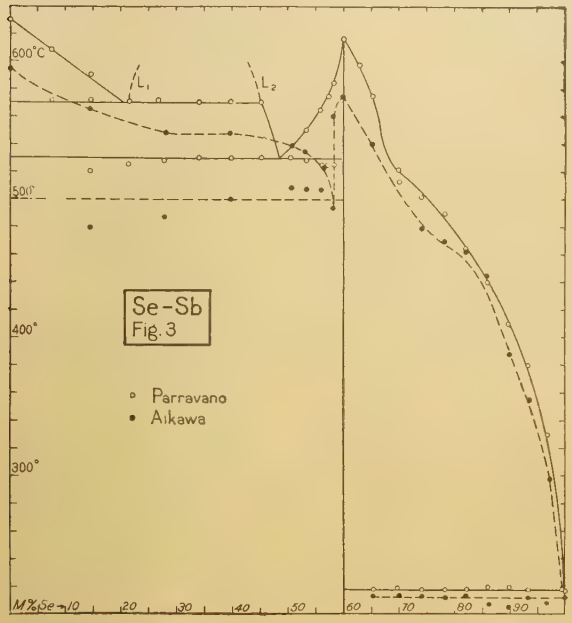
| °C ±4 (129) | °C ±5 (164) | M % A |
|---|---|---|
| B | | |
| **269** | **267** | **0** |
| B + AB(α) | | |
| 269E | 267E | (?) |
| AB(α) | | |
| 398 | 396 | 10 |
| AB(α) + AB(β) | | |
| 414* | 422U | 12 |
| AB(β) | | |
| 467 | 471 | 20 |
| 521 | 521 | 30 |
| 568 | 563 | 40 |
| AB(β) + $A_3B_2$ | | |
| 605U | 602U | 49 |
| $A_3B_2$ | | |
| 612 | 600 | 50 |
| 666 | 650 | 55 |
| 697 | 682 | 58 |
| 708 | 688 | 60 |
| 682 | 676 | 65 |
| 640 | 638 | 70 |
| 618 | 608 | 72† |
| 618 | 608 | 96† |
| | 546 | 98 |
| | 460 | 99 |
| $A_3B_2$ + A | | |
| | 161E | (?) |
| A | | |
| **217** | **217** | **100** |

* Only one form observed.
† Two liq. layers.

B = Sn (20, 132)

| °C ±10 | M % A |
|---|---|
| B | |
| **232** | **0** |
| B + BA | |
| 232E | (?) |




B = Sn.—(*Continued*)

| °C ±10 | M % A |
|---|---|
| BA | |
| 688 | 5 |
| 784 | 10 |
| 816 | 15 |
| 822 | 35 |
| **861** | **50** |
| 810 | 52.5 |
| 750 | 55 |
| 672 | 60 |
| $BA + BA_2$ | |
| 640E | 63.0 |
| $BA_2$ | |
| **652** | **66.7** |

B = Sn.—(*Continued*)

| °C ±10 | M % A |
|---|---|
| $BA_2$ | |
| 650 | 70 |
| 630 | 80 |
| 580 | 90 |
| 545 | 95 |
| A | |
| **216** | **100** |

B = Pb (64, 132)

| °C ±5 | M % A |
|---|---|
| B | |
| **325** | **0** |
| AB | |
| 802* | 10 |
| 856 | 15 |
| 895 | 20 |
| 943 | 30 |
| 982 | 40 |
| 1018 | 45 |
| **1088†** | **50** |

Two liq. layers from 67–100 M % A at 673° (liq. A + liq. $A_2B$) in equil. with solid $A_2B$ (132).

* 820° (132).

† 1065° (132).

B = Tl (116, 131)

| °C ±5 | M % A |
|---|---|
| B | |
| **287** | **0** |
| $B + B_2A$ | |
| 281E | 5† |
| $B_2A$ | |
| 361* | 10† |
| 361* | 31† |
| **367** | **33.3** |
| 365 | 35.4 |
| 351 | 39.2 |
| $B_2A + BA$ | |
| 283E | 40.0† |
| BA | |
| 295 | 43 |
| 304 | 46 |
| **310** | **50** |
| 307 | 52.5 |
| 301 | 55.0 |
| 284 | 59.0 |
| $BA + B_2A_3(\beta)$ | |
| 265U | 60† |
| $B_2A_3(\beta)$ | |
| 254 | 65 |
| 227 | 70 |
| $B_2A_3(\beta) + B_2A_3(\alpha)$ | |
| 165U | 72† |
| $B_2A_3(\alpha) + A$ | |
| 150E | 74† |
| A | |
| 177* | 80† |
| 177* | 98† |
| **217** | **100** |

* Two liq. layers.

† ±1 M % A.

B = Zn (39)

A, M. P. = 217°.

B, M. P. = 419°.

Not miscible in liq. state.

B = Cd (38)

A, M. P. = 217°.

B, M. P. = 321°.

Not miscible in liq. state.

B = Cu (64)

| °C ±2 | M % A |
|---|---|
| B | |
| **1084** | **0** |

B = Cu.—(*Continued*)

| °C ±2 | M % A |
|---|---|
| B | |
| 1080 | 0.2 |
| 1069 | 0.6 |
| $B + AB_2$ | |
| 1062E | 0.8 |
| $AB_2$ | |
| 1104 | 7.0 |
| 1105 | 20.0 |
| 1107 | 30.0 |
| **1114** | **33.3** |
| 947 | 39.1 |

B = Ag (64, 132, 135)

| °C* | M % A |
|---|---|
| B | |
| **962** | **0** |
| 918 | 5.0 |
| 896 | 10.0 |
| 892† | 11.0 |
| 892† | 30.0 |
| $B + AB_2$ | |
| 841E | 31.0 |
| $AB_2$ | |
| 886 | 32.0 |
| **897** | **33.3** |
| 870 | 35.0 |
| 770 | 37.5 |
| 720 | 40.0 |
| 636 | 45.0 |
| 620† | 45.1 |
| 616† | 90.0 |
| A | |
| **217** | **100** |

* ±1 (0–30 M % A); ±5 (30–100 M % A).

† Two liq. layers.

B = Au (60)

No data obtained due to volatility of Se.

B = Al (36, 58, 111)

| °C ±20 | M % A |
|---|---|
| B | |
| **648** | **0** |
| $B + A_xB_y$ | |
| 640 to 648E | (?) |
| $A_xB_y$ | |
| 736 | 5 |
| 800 | 10 |
| 890 | 20 |
| 930 | 30 |
| 950 | 40 |
| **952** | **50** |
| 930 | 60 |
| 880 | 70 |
| 785 | 80 |
| 590 | 90 |
| 430 | 95 |
| $A_xB_y + A$ | |
| 217(?)E | (?) |
| A | |
| **217** | **100** |

$A_xB_y = A_4B_3$ (36); $= A_2B_3$ (58, 111).

## Te

B = As (132)

| °C | M % A |
|---|---|
| (?) | |
| 358 | 50 |
| (?) + $A_3B_2$ | |
| 355E | 55 |
| $A_3B_2$ | |
| **362** | **60** |
| $A_3B_2$ + A | |
| 329E | 75 |
| A | |
| **452** | **100** |

B = Sb (54, 96, 103, 132)

| °C ±2 (96, 103) | °C ±5 (54) | M % A |
|---|---|---|
| B | | |
| **629** | **624** | **0** |
| 588 | 598 | 10* |
| 550 | 566 | 20* |
| B + $A_3B_2$ | | |
| 540E | | 29* |
| $A_3B_2$ | | |
| 554 | 565 | 40* |
| 600 | 604 | 50* |
| **622** | **627** | **60** |
| 590 | 608 | 70 |
| 547 | 518 | 80 |
| $A_3B_2$ + A | | |
| 421E | | 89.5 |
| | 421E | 85 |
| A | | |
| 432 | 436 | 95 |
| **442** | **446** | **100** |

| °C (132) | M % A |
|---|---|
| B | |
| **632** | **0** |
| B + $A_3B_2$ | |
| 538E | 46* |
| $A_3B_2$ | |
| 595 | 65 |
| 563 | 80 |
| $A_3B_2$ + A | |
| 425E | 94 |
| A | |
| **452** | **100** |

* (?) Mixed crystals.

B = Bi (3, 4, 114, 132)

| °C ±1 | M % A |
|---|---|
| B | |
| **267** | **0** |
| B + $A_3B_2$ | |
| 261E | 1 |
| $A_3B_2$ | |
| 294 | 5 |
| 334 | 10 |
| 402 | 20 |
| 452 | 30 |
| 499 | 40 |
| 539 | 50 |
| 561 | 55 |
| **573** | **60** |
| 570 | 65 |
| 562 | 70 |
| 521 | 80 |

B = Bi.—(*Continued*)

| °C ±1 | M % A |
|---|---|
| $A_3B_2$ | |
| 476 | 85 |
| 411 | 90 |
| $A_3B_2$ + A | |
| 388E | 91.5 |
| A | |
| 408 | 95 |
| **428** | **100** |

B = Sn (20, 54, 99, 100)

*See* Fig. 4

| °C | M % A |
|---|---|
| B | |
| **232**†‡ | **0** |
| **231*** | **0** |
| B + AB | |
| 232E† | (?) |
| 231E* | (?) |

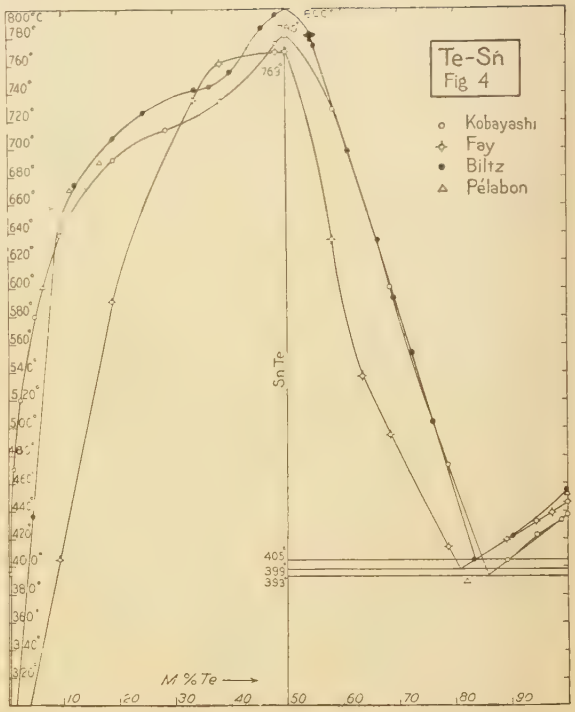
* (20) (Biltz). † (54) (Fay).
‡ (99, 100) (Kobayashi).

B = Pb (54, 97, 132)

| °C ±10 | M % A |
|---|---|
| B | |
| **326** | **0** |
| AB | |
| 680 | 10 |
| 755 | 20 |
| 805 | 30 |
| 865 | 40 |
| **910** | **50** |
| 820 | 60 |
| 680 | 70 |
| 530 | 75 |
| 450 | 80 |
| AB + A | |
| 406E | 85 |
| A | |
| 420 | 90 |
| 435 | 95 |
| **446** | **100** |

B = Tl (35, 132)

| °C ±15 | M % A | |
|---|---|---|
| B($\beta$) | | |
| **294** | **0** | |
| Mix. | | |
| 393* | 33.5 | 2 |
| 393* | 33.5 | 31 |
| 420 | 38 | 35 |
| $A_2B_3$ | | |
| **428** | **40** | |
| 390 | 45 | |
| 335 | 50 | |
| $A_2B_3$ + AB | | |
| 305U | 51.7† | |
| AB | | |
| 266 | 55 | |
| 252 | 60 | |
| 232 | 65 | |
| AB + A | | |
| 200E | 68.5† | |
| A | | |
| 220 | 70 | |
| 320 | 80 | |
| 382 | 90 | |
| 405 | 95 | |




B = Tl.—(*Continued*)

| °C ±15 | M % A |
|---|---|
| A | |
| **453** | **100** |

Solid state: B($\beta$)→B($\alpha$) at 230°.

* Two liq. layers. † ±2 M %.

B = Zn (101)

| °C ±5 | M % A |
|---|---|
| B | |
| **418** | **0** |
| BA | |
| 1220.5 | 48.8 |
| **1238.5** | **50.0** |
| 1170 | 60.0 |
| 1070 | 70.0 |
| 940 | 80.0 |
| 750 | 90.0 |
| A | |
| **443.5** | **100** |

B = Cd (99, 100)

| °C ±5 | M % A |
|---|---|
| B | |
| **322** | **0** |
| AB | |
| 692 | 0.88 |
| **1044** | **50** |
| 1000 | 60 |
| 890 | 70 |
| 810 | 80 |
| 710 | 85 |
| 680 | 90 |
| 580 | 95 |
| A | |
| **437** | **100** |

B = Hg (135)

| °C ±5 | M % A |
|---|---|
| AB | |
| 560 | 65 |
| 553 | 66.6 |
| 532 | 70 |
| 499 | 75 |
| 461 | 80 |
| AB + A | |
| 410E | 86 |
| A | |
| 422 | 90 |
| 436 | 95 |
| **451** | **100** |

B = Cu (33)

| °C | M % A | |
|---|---|---|
| B | | |
| **1055** | **0** | |
| 1027.5* | 1.0 | |
| 1027.5* | 31.5 | |
| 890 | 32.0 | |
| B + $AB_2(\gamma)$ | | |
| **858U** | **33.3** | |
| Mix. | | |
| 830 | 34 | 35.0 |
| 740 | 36.5 | 40.0 |
| 678 | 38.0 | 45.0 |
| (Mix. + $A_3B_4(\beta)$ | | |
| 620U | 40.0 | 50.5 |
| $A_3B_4(\beta)$ | | |
| 543 | 55.0 | |
| 450 | 60.0 | |
| ($A_3B_4(\beta)$ + $A_3B_4(\alpha)$ | | |
| 364 5U | 66 0 | |

B = Cu.—(*Continued*)

| °C | M % A |
|---|---|
| $A_3B_4(\alpha)$ + A | |
| 343E | 69.0 |
| A | |
| 392 | 85.0 |
| **438** | **100** |

Solid state. $AB_2(\gamma) \rightarrow AB_2(\beta)$ at 384°; $AB_2(\beta) \rightarrow AB_2(\alpha)$ at 350°.

Values of M % A > 70 are *ca.* 2 % too high, due to vaporization of Te.

B = Ag (41, 130, 132, 139, 155)

| °C ±10 | M % A |
|---|---|
| B | |
| **961** | **0** |
| 938 | 2.5 |
| 916 | 5 |
| B + $AB_2$(?)* | |
| 866E | 10 |
| $AB_2$ | |
| 870 | 25 |
| 890 | 30 |
| **958** | **33.3** |
| 880 | 35 |
| 672 | 40 |
| 550 | 45 |
| 475 | 50 |
| $AB_2$ + AB($\beta$) | |
| 442U | 53.6 |
| AB($\beta$) | |
| 422 | 55 |
| AB($\beta$) + AB($\alpha$) | |
| 410U | 56 |
| AB($\alpha$) | |
| 380 | 60 |
| 356 | 65 |
| AB($\alpha$) + A | |
| 347.5E | 67.5 |
| A | |
| 362 | 70 |
| 392 | 80 |
| 422 | 90 |
| **451** | **100** |

* Region from 10–27 M % A is uncertain.

B = Au (133, 140, 149)

| °C | M % A |
|---|---|
| B | |
| **1064** | **0** |
| 1045 | 2 |
| 1010 | 5 |
| 967 | 10 |
| 908 | 20 |
| 839 | 30 |
| 791 | 35 |
| 712 | 40 |
| 615 | 45 |
| 500 | 50 |
| B + $A_2B$ | |
| 447E* | 52 |
| $A_2B$ | |
| 457 | 60 |
| **464** | **67** |
| 461 | 70 |
| 445 | 75 |

B = Au.—(*Continued*)

| °C | M % A |
|---|---|
| $A_2B$ | |
| 444 | 80 |
| 426 | 85 |
| $A_2B$ + A | |
| 416E† | 87 |
| A | |
| 422 | 90 |
| 435 | 95 |
| 443 | 98 |
| **451** | **100** |

* 432° at 50 M % A (149); 452° at 55 M % A (133).

† 397° at 85.7 M % A (149); 415° at 88.7 M % A (133).

B = Al (40, 117)

| °C ±10 | M % A |
|---|---|
| B | |
| **649** | **0** |
| B + $A_3B_2$ | |
| 622E | 0.5 |
| $A_3B_2$ | |
| 690 | 2.0 |
| 730 | 4.0 |
| 766 | 10 |
| 800 | 20 |
| 820 | 30 |
| 830 | 40 |
| 852 | 50 |
| 870 | 55 |
| **885** | **60** |
| Mix.($\beta$) | |
| 880 \| 61 | 65 |
| 820 \| 67 | 75 |
| Mix.($\beta$) + Mix.($\alpha$) | |
| 541U \| 71 | 79 |
| Mix.($\alpha$) | |
| 475 \| 71 | 80 |
| Mix.($\alpha$) + A | |
| 420E \| 71 | 90 |
| A | |
| **440** | **100** |

Solid state: $AB_5$ forms at 551° at 0–60 M % A; from 551–700°, Mix. ($\beta$) ⇆ Mix.($\alpha$).

B = Na (138)

| °C ±2 | M % A |
|---|---|
| B | |
| **97.5** | **0** |
| $AB_2$ | |
| 560 | 10 |
| 740 | 20 |
| 860 | 25 |
| **959** | **33.3** |
| 868 | 37.5 |
| 715 | 40 |
| 579 | 42.5 |
| 483 | 45 |
| 381 | 47.5 |
| $AB_2$ + $A_2B_3$ | |
| 348U | 48.5 |
| $A_2B_3$ | |
| 340 | 50 |
| 331 | 51.5 |
| $A_2B_3$ + $A_7B_3$ | |
| 317E | 53.8 |

B = Na.—(*Continued*)

| °C ±2 | M % A |
|---|---|
| $A_7B_3$ | |
| 341 | 55 |
| 389 | 57.5 |
| 412 | 60 |
| 432 | 62.5 |
| 435* | 63.0 |
| 435* | 75.0 |
| 430 | 77.5 |
| 423 | 80.0 |
| $A_7B_3$ + A | |
| 401.5E | 83.5 |
| A | |
| 408 | 85 |
| 427 | 90 |
| 439 | 95 |
| 446 | 98 |
| **452** | **100** |

* Two liq. layers.

## P

B = Cu (82)

| °C ±10 | M % A |
|---|---|
| B | |
| **1084** | **0** |
| 1045 | 2.5 |
| 1006 | 5.0 |
| 969 | 7.5 |
| 932 | 10.0 |
| 891 | 12.5 |
| 800 | 15.0 |
| B + $AB_3$ | |
| 707E | 15.6 |
| $AB_3$ | |
| 808 | 17.5 |
| 905 | 20.0 |
| 960 | 22.0 |
| 983 | 23.0 |
| 1003 | 24.0 |
| $AB_3$ + Mix. | |
| **1018**(U?) \| (?) | **25.0** |
| Mix. | |
| 1023 \| (?) | 25.5 |
| 1024 \| (?) | 25.75 |
| 1023 \| (?) | 26.0 |
| 1022 \| (?) | 26.5 |

B = Mn (177)

| | |
|---|---|
| B | |
| **1260** | **0** |
| 1013 ↓ | 8 |
| B + $A_2B_5$ | |
| 964E | 9.5 |
| $A_2B_5$ | |
| 977 | 10 |
| 1078 | 14 |
| 1162 | 18 |
| 1202 | 20 |
| 1295 | 24 |
| **1390** | **28.6** |
| 1373 | 30.0 |
| 1345 | 32.0 |
| 1270 | 36.0 |
| 1215 | 38.0 |
| 1130 | 40.0 |

B = Mn.—(*Continued*)

| °C ±10 | M % A |
|---|---|
| $A_2B_5$ + AB | |
| 1095E | 40.5 |
| AB | |
| 1120 | 41.0 |
| 1148 | 42.0 |
| 1172 | 44.0 |
| 1178 | 46.0 |
| 1180 | 47.0 |
| **1181** | **50.0** |

B = Co (178)

| °C ±5 | M % A |
|---|---|
| B | |
| **1500** | **0** |
| 1410 | 5 |
| 1300 | 10 |
| 1174 | 15 |
| B + $AB_2$ | |
| 1022E | 19.8 |
| $AB_2$ | |
| 1120 | 22 |
| 1190 | 24 |
| 1248 | 26 |
| 1295 | 28 |
| 1334 | 30 |
| 1367 | 32 |
| **1386** | **33.3** |
| 1382 | 33.7 |

B = Ni (102)

| °C ±10 | M % A |
|---|---|
| B | |
| **1484** | **0** |
| 1010 ↓ | 15 |
| B + $AB_3$ | |
| 880E | 19 |
| $AB_3$ | |
| 908 | 20 |
| 953 | 22 |
| $AB_3$ + $A_2B_5(\beta)$ | |
| 975U | 23.3 |
| $A_2B_5(\beta)$ | |
| 1010 | 24.0 |
| $A_2B_5(\beta)$ + $A_2B_5(\alpha)$ | |
| 1025U | 24.2 |
| $A_2B_5(\alpha)$ | |
| 1084 | 25.0 |
| 1140 | 26.0 |
| 1168 | 27.0 |
| 1181 | 28.0 |
| **1185** | **28.6** |
| Mix.* | |
| 1160 \| 29 | 30.0 |
| 1135 \| 29.4 | 31.0 |
| Mix. + $AB_2$ | |
| 1108E \| 29.8 | 32.2 |
| $AB_2$* | |
| **1112** | **33.3** |
| 1108 | 34.0 |
| 1092 | 35.0 |
| 1048 | 36.0 |

* Solid state: There is a transformation of "Mix." at 1000° and of $Ni_2P$ at *ca.* 840°.

### C

B = V (152)

| °C ±10 | M % A |
|---|---|
| B | |
| **1715** | **0** |
| B + AB(?) | |
| (?)E | (?) |
| AB(?) | |
| 1890 | 5.0 |
| 2170 | 10 |

B = V.—(*Continued*)

| °C ±10 | M % A |
|---|---|
| AB(?) | |
| 2355 | 15 |
| 2490 | 20 |
| 2600 | 25 |
| 2680 | 30 |
| 2730 | 35 |
| 2750 | 40 |
| **2760** | **50** |

**Sec. 2. The A-Components are Elementary Substances; the B-Components are Compounds Whose Key-Formulae Do Not Begin with 16**

Standard arrangement for both components (*v.* Vol. III, p. viii)

### $Cl_2$

B = $H_2O$ (12, 13)

| °C | M % Cl ±0.01 |
|---|---|
| $H_2O + Cl(H_2O)x$ | |
| − 0.24E | 0.125 |
| $Cl(H_2O)x$ | |
| 0.00 | 0.130 |
| + 2.0 | 0.163 |
| 4.0 | 0.186 |
| 6.0 | 0.209 |
| 8.0 | 0.232 |
| 9.0 | 0.245 |
| 20.0 | 0.470 |
| 28 7* | 0.930 |

$x = 8$ (12, 13); $= 6$ (29.5).

* Two liq. layers.

B = HCl (106)

| °C ±0.1 | M % A |
|---|---|
| B | |
| **−112** | **0** |
| −122.6 | 10 |
| B + A | |
| −127.5E | 14.5 |
| A | |
| −124.9 | 20 |
| −120.4 | 30 |
| −116.5 | 40 |
| −112.9 | 50 |
| −109.9 | 60 |
| −107.3 | 70 |
| −105.0 | 80 |
| −103.1 | 90 |
| **−101.5** | **100** |

B = $SO_2$ (72, 73, 158)

In the dark

| °C ±0.3 | M % A |
|---|---|
| B | |
| **− 75.2** | **0** |
| − 80.6 | 10 |
| − 83.3 | 20 |
| − 84.9 | 30 |
| − 86.1 | 40 |
| − 87.1 | 50 |
| − 87.8 | 60 |
| − 88.5 | 70 |
| − 89.2 | 75 |
| − 90.5 | 80 |
| − 95.0 | 90 |
| −100.1 | 95 |
| B + Mix. | |
| −102.2E | 96.5* |

B = $SO_2$.—(*Continued*)

| °C ±0.1 | M % A |
|---|---|
| A | |
| **−100.9** | **100** |
| In the light | |
| B | |
| **− 75.2** | **0** |
| B + BA | |
| (?)E | (?) |
| BA | |
| − 79.8 | 30 |
| − 69.4 | 40 |
| − 62.4 | 45 |
| **− 54.1** ↓ | **50** |
| −106.3 ↓ | 80 |
| BA + A | |
| −109.1E | 81.7 |
| A | |
| −107.5 | 85 |
| −105.1 | 90 |
| −102.9 | 95 |
| **−100.9** | **100** |

* 98.5 at −102.3°C(158).

B = NOCl (26)

| °C ±1* | M % A |
|---|---|
| B | |
| **− 64.5** | **0** |
| − 72.5 | 10 |
| − 80.5 | 20 |
| − 88.5 | 30 |
| − 97.0 | 40 |
| −105.0 | 50 |
| −107 | 54 |
| (?)† | |
| −107.5 | 57.5 |
| (B + A)(?)† | |
| −112E? | 57.5 |
| (?)† | |
| −107.5 | 60 |
| −106 | 65 |
| A | |
| −103.5 | 70 |
| −101 | 75 |
| − 99 | 80 |
| − 97 | 85 |
| − 95.5 | 90 |
| − 95 | 95 |
| **− 94.4** | **100** |

* This is the mean between $t_L$ and $t_S$ where $t_L - t_S \geq 6.5°$.

† It is possible that an unstable compound is formed in this region.

B = $AsCl_3$ (21)

| °C ±2 | M % A |
|---|---|
| B | |
| **− 16.0** | **0** |
| − 22.0 | 10 |
| − 28.0 | 20 |
| − 34.5 | 30 |
| − 41.5 | 40 |
| − 48.5 | 50 |
| − 56.5 | 60 |
| − 66.0 | 70 |
| − 79.0 | 80 |
| − 88.0 | 85 |
| − 98.0 | 90 |
| B + A | |
| −107.0E | 93.5 ± 1 |
| A | |
| **−100.9** | **100** |

B = $SiCl_4$ (21)

| °C ±0.5 | M % A |
|---|---|
| B | |
| **− 68.0** | **0** |
| − 72.5 | 10 |
| − 78.0 | 20 |
| − 84.5 | 30 |
| − 91.5 | 40 |
| − 99.0 | 50 |
| −107.0 | 60 |
| −115.0 | 70 |
| B + A | |
| −116.5E | 72 ± 1 |
| A | |
| −113.0 | 80 |
| −107.5 | 90 |
| **−100.9** | **100** |

B = $TiCl_4$ (21)

| °C ±1.5 | M % A |
|---|---|
| B | |
| **− 22.5** | **0** |
| − 28.5 | 10 |
| − 35.0 | 20 |
| − 42.0 | 30 |
| − 49.0 | 40 |
| − 57.0 | 50 |
| − 67.5 | 60 |
| − 82.0 | 70 |
| − 91.0 | 75 |
| −102.0 | 80 |
| B + A | |
| −108.0E | 82 ± 1 |
| A | |
| −105.5 | 90 |
| **−100.9** | **100** |

B = $SnCl_4$ (21)

| °C ±2 | M % A |
|---|---|
| B | |
| **− 33.0** | **0** |
| − 37.5 | 10 |
| − 43.0 | 20 |
| − 50.0 | 30 |
| − 58.0 | 40 |
| − 67.5 | 50 |
| − 79.0 | 60 |
| − 86.0 | 65 |
| − 96.5 | 70 |

B = $SnCl_4$.—(*Continued*)

| °C ±2 | M % A |
|---|---|
| B + A | |
| −105.0E | 72.5 ± 1 |
| A | |
| **−100.9** | **100** |

Compn. of solid phase over 0–29 M % A is somewhat doubtful.

### $Br_2$

B = $H_2O$ (13, 71, 175)

| °C | M % A |
|---|---|
| B | |
| **0.00** | **0** |
| B + $AB_8$ | |
| −0.3E | 0.347 |
| $AB_8$ | |
| 0.0 | 0.265‡ |
| 0.0 | 0.270* |
| +3.0† | 0.344* |
| 5.12 | 0.427‡ |
| 6.0 | 0.406* |
| 6.2 | 0.411* |
| 7.5§ | 0.407† |
| +7.5§ | 99.5† |
| A | |
| **−7.5** | **100** |

* (13). † (71). ‡ (175).

§ Two liq. layers.

B = HBr (32)

| °C ±0.2 | M % A |
|---|---|
| B | |
| **−87.3** | **0** |
| −87.8 | 1 |
| −88.5 | 2 |
| −90.8 | 3 |
| B + A | |
| −95E | 4 |
| A | |
| −87 | 5 |
| −72.2 | 10 |
| −58.2 | 20 |
| −49.0 | 30 |
| −42.2 | 40 |
| −35.8 | 50 |
| −29.8 | 60 |
| −23.8 | 70 |
| −18.2 | 80 |
| −12.5 | 90 |
| **− 7.5** | **100** |

Composition of solid phases somewhat doubtful.

B = $SO_2$ (72, 73)

| °C ±0.2 | M % A |
|---|---|
| B | |
| **−75.1** | **0** |
| B(?) + A | |
| −75.5E | 1 |
| A | |
| −56 | 2.5 |
| −42 | 5.0 |
| −28.5 | 10.0 |
| −22.5 | 15.0 |
| −18.8 | 20.0 |
| −15.2 | 30.0 |

B = $SO_2$.—(*Continued*)

| °C ±0.2 | M % A |
|---|---|
| | A |
| −14.0 | 50.0 |
| −13.8 | 70.0 |
| −13.0 | 80.0 |
| −11.0 | 90.0 |
| − 9.3 | 95.0 |
| **− 7.1** | **100** |

Equil. is not changed by light, darkness, or presence of catalysts.

B = NO (165)

| °C ±1 | M % A |
|---|---|
| | $B_2A$ |
| **−55.7** | **33.3** |
| −57.5 | 35.0 |
| −63.3 | 40.0 |
| | $B_2A + B_2A_3$ |
| −66.0E | 42.0 |
| | $B_2A_3$ |
| −56.5 | 45.0 |
| −46.5 | 50.0 |
| −41.5 | 55.0 |
| −40.0 | 60.0 |
| −42.0 | 65.0 |
| | $B_2A_3 + A$ |
| −47.0E | 70.5 |
| | A |
| −33.5 | 75.0 |
| −24 0 | 80.0 |
| −16.5 | 85 0 |
| **− 7.5** | **100** |

Compn. of solid phases somewhat uncertain.

## $I_2$

B = $H_2O$ (56, 77, 79, 92, 93, 118, 155.5, 156)

*v. also* p. 266

| °C | $10^5$ M % A ±2 |
|---|---|
| | A |
| **0** | 116 |
| **15** | 180 |
| **18** | 196 |
| **20** | 207 |
| **25** | 241 |
| **35** | 331 |
| **45** | 459 |
| **55** | 655 |

B = $HgI_2$ (121)

| °C | M % B |
|---|---|
| | A |
| **112** | **0** |
| 103.6↓ | 10 |
| | A + B |
| 100.8E | 13.2 |
| | B |
| 112.5↓ | 20 |
| 134 5↓ | 32 5 |

B = $CaI_2$ (121)

| °C | M % B |
|---|---|
| | A |
| **112** | **0** |
| 99 | 7.9 |
| 82.6 | 15.0 |

B = $CaI_2$.—(*Continued*)

| °C | M % B |
|---|---|
| | A |
| 72.7 | 20.0 |
| | A + (?) |
| 71.0E | **21** |
| | (?) |
| 73.4 | 23.0 |
| 74.7 | 25.0 |
| 74.8 | 27.3 |
| 74.8 | 30.8 |
| 74.5 | 43.4 |
| 77.2 | 54.9 |

B = KI (1, 104, 127)

| °C ±1* | M % B |
|---|---|
| | A |
| **112** | **0** |
| 108.5 | 5 |
| 102 | 10 |
| 92.5 | 15 |
| 81.5 | 20 |
| | $A + A_3B_2$(?) |
| 77.5E | 22 |
| | $A_3B_2$(?) |
| 79 | 30 |
| **80** | **40** |
| 79 | 45 |
| | $A_3B_2$(?) + B(?) |
| 75E | 50 |

* From 0–20 M % B.

## $S_8$

B = $H_2S_2$*(172)

| °C | M % A |
|---|---|
| | A |
| −35 | 2.5 |
| −30 | 5.5 |
| −20 | 13.0 |
| −10 | 22 5 |
| − 1.45 | 33.3† |
| 0 | 34.0 |
| +10 | 39.0 |
| 20 | 43.5 |
| 25 | 45.6 |
| 30 | 47.7 |
| 40 | 52.2 |
| 50 | 57.2 |
| 55 | 60.0 |

* The same equil. is obtained with $H_2S_3$.

† A sharp break in the curve here indicates the formation of $H_2S_8$.

B = $NH_3$ (151)

| °C ±0.2 | M % A |
|---|---|
| | B |
| **−77.3** | **0** |
| −78.2 | 0.5 |
| −79.1 | 1.0 |
| | $B + B_6A_{1/6}$ |
| −79.6E | 1.275 |
| | $B_6A_{1/6}$ |
| −79.4 | 1.30 |
| −78.9 | 1.40 |
| −78.6 | 1.50 |
| −78.5 | 1.60 |
| −78.4 | 1.80 |
| **−78.3** | **2.07** |

B = $NH_3$.—(*Continued*)

| °C ±0.2 | M % A |
|---|---|
| | $B_6A_{1/6}$ |
| −79.9 | 2.50 |
| −81.7 | 3.00 |
| −83.3 | 3.50 |
| −84.5 | 4.00 |
| | A |
| −20 | 3.92 |
| 0 | 3.08 |
| +15 | 2.30 |
| 30 | 1.73 |
| 40 | 1.48 |
| 45 | 1.38 |

The nearly const. soly. of A in B from −20 to −84° indicates the formation of $S(NH_3)_3$.

B = $SnCl_4$ (66)

| °C | M % A |
|---|---|
| | A |
| 99 | 5.56 |
| 101 | 5.92 |
| | A (liq.) |
| 110 | 8.29 |
| 112 | 8.92 |
| 121 | 14.72 |

B = $SnI_4$ (48.5)

| °C | Wt. % B |
|---|---|
| 130 | 90.8 |
| 104 | 76.2 |

B = $HgCl_2$ (122)

| °C ±1 | M % A |
|---|---|
| | B |
| **287** | **0** |
| 284 | 2.5 |
| 281 | 5.0 |

B = $HgCl_2$.—(*Continued*)

| °C ±1 | M % A |
|---|---|
| | B |
| 277.5* | 6.8 |
| 277.5* | 89.5 |
| | A |
| **117** | **100** |

## $Se_8$

B = $HgCl_2$ (122)

| °C ±1 | M % A |
|---|---|
| | B |
| **287** | **0** |
| 280 | 5 |
| 272.3* | 11 |
| 272.3* | 83 |
| | A |
| **218** | **100** |

B = $HgBr_2$ (125)

| °C ±0.2 | M % A |
|---|---|
| | B |
| **236** | **0** |
| 232.2 | 2.5 |
| 230.2 | 5.0 |
| 227.4* | 9.5 |
| 227.4* | 40.5 |
| 226.7 | 45 |
| 225.7 | 50 |
| 224.5 | 55 |
| 223 | 60 |
| 221 | 65 |
| | B + A |
| 210 to 211E | 75 ± 5 |
| | A |
| **217** | **100** |

* Two liq. layers.

**Sec. 3. The A-Components are Elementary Substances in Standard Arrangement; the B-Components are Compounds (in C-Arrangement) Whose Key-Formulae Begin with 16** (*v.* Vol. III, p. viii)

## $Cl_2$

B = $CCl_4$ (21)

| °C ±1 | M % A |
|---|---|
| | B |
| **− 22** | **0** |
| − 31.5 | 5 |
| − 41.5 | 10 |
| | B + (?) |
| − 48.0U | 13.5 ± 1 |
| | (?) |
| − 48 5 | 15 |
| − 51 5 | 20 |
| − 55.0 | 25 |
| − 58.5 | 30 |
| − 62.5 | 35 |
| − 67.5 | 40 |
| − 78.0 | 50 |
| − 91.0 | 60 |
| −107.0 | 70 |
| | (?) + A |
| −115.0E | 75 ±1 |
| | A |
| −106.0 | 90 |
| **−102.0** | **100** |

B = $CO_2$ (163)

| °C | M % B |
|---|---|
| | B |
| −78.60 | 82.5* |

* 93.1 vol. % in vapor phase at $p$ = 750 mm.

B = $C_3H_6O$ (106)

Acetone

| °C ±1 | M % A |
|---|---|
| | BA |
| − 80 | 15 |
| − 73.7 | 20 |
| − 68.2 | 25 |
| − 68 5 | 30 |
| − 59.5 | 35 |
| − 56.7 | 40 |
| − 54.7 | 45 |
| **− 54.0** | **50** |
| − 55.0 | 55 |
| − 57.0 | 60 |
| − 60.2 | 65 |
| − 65.3 | 70 |
| − 74.0 | 75 |
| − 98.5 | 85 |

### $Cl_2$.—(*Continued*)

$B = C_3H_6O$.—(*Continued*)

| °C ±1 | M % A |
|---|---|
| BA + A | |
| −104.0E | 90 |
| A | |
| −102.7 | 95 |
| **−101.5** | **100** |

U possible at −95° and 82 M % A.

### $B = C_4H_8O_2$ (106)

Ethyl acetate

| °C ±0.5 | M % A |
|---|---|
| B | |
| − 83.0 | 0 |
| − 85 6 | 10 |
| − 89.0 | 15 |
| B + $BA_2$ | |
| − 92.0E | 18 |
| $BA_2$ | |
| − 90.2 | 20 |
| − 85.7 | 25 |
| − 81.7 | 30 |
| − 78.3 | 35 |
| − 75.5 | 40 |
| − 73.1 | 45 |
| − 71.3 | 50 |
| − 69.9 | 55 |
| − 68.9 | 60 |
| **− 68.2** | **66.7** |
| − 69.1 | 70 |
| − 71.5 | 75 |
| − 75.6 | 80 |
| − 82.0 | 85 |
| − 92.0 | 90 |
| $BA_2$ + A | |
| −104.0E | 94 |
| A | |
| −102.5 | 97.5 |
| **−101.5** | **100** |

### $B = C_4H_{10}O$ (113)

Ethyl ether

| °C ±1 | M % A |
|---|---|
| B | |
| **−118** | **0** |
| BA | |
| −100 | 2.5 |
| − 90 | 5.0 |
| − 80 | 10.0 |
| − 70 | 20.0 |
| − 60 | 30.0 |
| − 52 | 40.0 |
| − 50 | 45.0 |
| **− 49** | **50.0** |
| − 50 | 55.0 |
| − 52 | 60.0 |
| − 55 | 65.0 |
| − 58.5 | 70.0 |
| − 64 | 75.0 |
| − 72 | 80.0 |
| − 86 | 85.0 |
| − 94 | 87.5 |
| BA + A | |
| −105E | 90.0 |

### $B = C_4H_{10}O$.—(*Continued*)

| °C ±1 | M % A |
|---|---|
| A | |
| −102.5 | 95.0 |
| **−101.5** | **100** |

### $B = C_7H_8$ (106)

Toluene

| °C* | M % A |
|---|---|
| B | |
| − 94.0 | 0 |
| − 98.0 | 5 |
| −104.0 | 10 |
| B + BA | |
| −114.0E | 16 |
| BA | |
| −110.2 | 25 |
| −107.5 | 30 |
| −104.5 | 35 |
| −101.5 | 40 |
| − 99.5 | 45 |
| **− 98.0** | **50** |
| − 99.5 | 57.5 |
| BA + $BA_2$ | |
| −102.5E | 62 |
| $BA_2$ | |
| −101.5 | 65 |
| **−101.5** | **66.6** |
| −102.0 | 72.5 |
| −103 0 | 75 |
| −107.2 | 80 |
| $BA_2$ + A | |
| −112.0E | 85.5 |
| A | |
| −109.5 | 90 |
| −106.0 | 95 |
| **−101.5** | **100** |

* ±2 (0–16 M % A); ±0.5 (16–100 M % A).

## $Br_2$

### $B = CBr_4$ (21)

| °C | M % A |
|---|---|
| B | |
| **88.5*** | **0** |
| 58.5† | 10 |
| B + (?) | |
| 48.0U† | 13.5‡ |
| (?) | |
| 34.5§ | 25 |
| 5.7§ | 50 |
| (?) + A | |
| −23.0E§ | 75‡ |
| A | |
| −20.2‖ | 80 |
| −13.7‖ | 90 |
| **− 7.3¶** | **100** |

* ±1.5°. § ±2°.
† ±4°. ‖ ±0.5°.
‡ ±1 %. ¶ ±0.2°.

### $B = CS_2$ (8)

| °C | M % A |
|---|---|
| A | |
| − 95 | 28.37 |
| −110.5 | 23.35 |
| −116 | 21.79 |

### $B = CH_4O$ (106)

Methyl Alcohol

| °C ±1 | M % A |
|---|---|
| B | |
| **− 97.0** | **0** |
| −103.5 | 5.0 |
| B + $BA_2$(?) | |
| −106.5E | 7.5 |
| $BA_2$(?) | |
| − 95.0 | 10.0 |
| − 86.7 | 12.5 |
| − 80.0 | 15.0 |
| − 75.0 | 17.5 |
| − 71.5 | 20.0 |
| − 67.0 | 25.0 |
| − 65.0 | 30.0 |
| **− 64.5**(?) | **33.3** |
| $BA_2$(?) + A | |
| −64.7E(U?) | 33.5 |
| A | |
| − 61.5 | 35.0 |
| − 50.5 | 40.0 |
| − 42.0 | 45.0 |
| − 35.0 | 50.0 |
| − 24.5 | 60.0 |
| − 17.5 | 70.0 |
| − 13.0 | 80.0 |
| − 10.0 | 90.0 |
| **− 7.3** | **100** |

### $B = C_2H_5Br$ (176)

| °C ±1.5 | M % A |
|---|---|
| B | |
| **−115.5** | **0** |
| −116.7 | 5 |
| B + $BA_x$ | |
| −118E | 10* |
| $BA_x$ | |
| −109 | 15 |
| −102 | 20 |
| − 96 | 25 |
| − 91 | 30 |
| − 86.7 | 35 |
| − 83 | 40 |
| − 80 | 45 |
| $BA_x$ + A | |
| − 78U | 50* |
| A | |
| − 55 | 60 |
| − 37.5 | 70 |
| − 24.5 | 80 |
| − 14.5 | 90 |
| **− 7.3** | **100** |

* ±1 %.

### $B = C_2H_6O$ (106)

Ethyl alcohol

| °C ±0.5 | M % A |
|---|---|
| $B_2A$ | |
| −92.0 | 12.5 |
| −87.5 | 15.0 |
| −80.0 | 20.0 |
| −74.2 | 25.0 |
| −70.0 | 30.0 |
| **−67.5** | **33.3** |
| −68.0 | 35.0 |
| −69.0 | 37.5 |
| −71.3 | 40.0 |

### $B = C_2H_6O$.—(*Continued*)

| °C ±0.5 | M % A |
|---|---|
| $B_2A$ + $BA_2$(?) | |
| −76.0E | 43.5* |
| $BA_2$(?) | |
| −71.2 | 45.0 |
| −63.5 | 47.5 |
| −52.2 | 50.0 |
| −47.5 | 55.0 |
| −40.8 | 60.0 |
| −36.0 | 65.0 |
| **−35.0**(?) | **66.7** |
| $BA_2$(?) + A | |
| −34.5E(U?) | 67.0* |
| A | |
| −25.5 | 70.0 |
| −18.5 | 75.0 |
| −14.3 | 80.0 |
| −11.5 | 85.0 |
| − 9.3 | 90.0 |
| − 8.0 | 95.0 |
| **− 7.3** | **100** |

* ±1 %.

### $B = C_3H_6O$ (106)

Acetone

| °C ±0.5 | M % A |
|---|---|
| BA | |
| −76 | 5 |
| −53.5 | 10 |
| −39.0 | 15 |
| −29.5 | 20 |
| −22.0 | 25 |
| −17.5 | 30 |
| −12.3 | 35 |
| − 9.2 | 40 |
| − 7.5 | 45 |
| **− 7.0** | **50** |
| −12.0 | 55 |
| −19.0 | 60 |
| −28.0 | 65 |
| BA + A | |
| −35.0E | 68* |
| A | |
| −33.0 | 70 |
| **− 7.3** | **100** |

* ±1 %.

### $B = C_4H_8O_2$ (106)

Ethyl acetate

| °C ±1 | M % A |
|---|---|
| B | |
| **−83.0** | **0** |
| B + BA(?) | |
| −86.0E | 3 |
| BA(?) | |
| −80.5 | 5 |
| −75.0 | 7.5 |
| −71.5 | 10.0 |
| −68.5 | 12.5 |
| −60.0 | 21.5 |
| −55.5 | 25 |
| −50.0 | 30 |
| −45.0 | 35 |
| −41.0 | 40 |
| −38.0 | 45 |
| −36.0 | 50 |
| **−34.5** | **55*** |

C = $C_4H_8O_2$.—(*Continued*)

| °C ±1 | M % A |
|---|---|
| BA(?) | |
| −35 | 60 |
| −36.5 | 65 |
| BA(?) + A | |
| −37.5E | 68.5 |
| A | |
| −36.0 | 70 |
| −29.5 | 75 |
| −24.0 | 80 |
| −19.0 | 85 |
| −14.5 | 90 |
| −10.5 | 95 |
| **− 7.3** | **100** |

* Max. does not coincide with the composition. BA.

B = $C_4H_{10}O$ (113)
Ethyl ether

| °C ±1 | M % A |
|---|---|
| B | |
| **−118** | **0** |
| B + $BA_2$(?) | |
| −121E | 4 |
| $BA_2$(?) | |
| −117 | 5 |
| −105 | 7.5 |
| − 94.5 | 10.0 |
| − 85.5 | 12.5 |
| − 78.0 | 15.0 |
| − 67.0 | 20.0 |
| − 59.0 | 25.0 |
| − 52.5 | 30.0 |
| − 47.0 | 35.0 |
| − 43.0 | 40.0 |
| − 40.0 | 45.0 |
| **− 38.5** | **50.0** |
| $BA_2$(?) + $B_2A_2$ | |
| ?E(U?) | (?) |
| $B_2A_2$ | |
| − 12.0 | 57 |
| **+ 23.0** | **60** |
| − 3 | 70 |
| $B_2A_2$ + A | |
| − 23.0E | 77 |
| A | |
| − 21.0 | 80 |
| − 14.0 | 90 |
| **− 7.3** | **100** |

$I_2$

B = $CCl_4$ (83, 85)

| °C | M % A ±0.02 |
|---|---|
| A | |
| 0 | 0.418 |
| 10 | 0.631 |
| 20 | 0.920 |
| 25* | 1.10 |
| 40 | 1.69 |
| 50 | 2.68 |

* At 25°, 0.237 g-mole of A soluble in 1 l soln. (A + B) (80).

B = $CS_2$ (7, 85, 88)

| °C | M % A ±0.5 |
|---|---|
| A | |
| −110 | 0.046 |
| −100 | 0.049 |
| − 90 | 0.060 |
| − 80 | 0.085 |
| − 70 | 0.140 |
| − 60 | 0.220 |
| − 50 | 0.335 |
| − 40 | 0.495 |
| − 30 | 0.740 |
| − 20 | 1.12 |
| − 10 | 1.68 |
| 0 | 2.4 |
| + 10 | 3.40 |
| 20 | 4.90 |
| 30 | 6.68 |
| 40 | 9.20 |
| 50 | 12.7 |

At 18°, 177 g A per l solution (6).

B = $CHBr_3$ (166)

| °C | M % A |
|---|---|
| A | |
| 25 | 6.6 |

B = $CHCl_3$ (8, 49, 74, 88, 109)

| °C | M % A ±0.02 | |
|---|---|---|
| A | | |
| −75 | 0.037 | |
| −70 | 0.041 | (88) |
| −60 | 0.058 | 0.040 |
| −50 | 0.085 | 0.070 |
| −40 | 0.122 | 0.107 |
| −30 | 0.175 | 0.167 |
| −25 | 0.210 | |
| −20 | 0.251 | |
| −15 | 0.305 | |
| −10 | 0.39 | |
| − 5 | 0.48 | (85) |
| 0 | 0.58 | 0.93 |
| +10 | 0.84 | 1.40 |
| 20 | 1.21 | 1.95 |
| 30 | 1.775 | 2.70 |
| 40 | | 3.80 |
| 50 | | 5.30 |

At 25°, 0.352 g-mole of A soluble in 1 l soln. (A + B) (80).

B = $CHI_3$ (124)

| °C ±0.5 | M % A |
|---|---|
| Mix.(?) | |
| **119.7** | **0** |
| 114.3 | 10 |
| 108.7 | 20 |
| 102.8 | 30 |
| 96.8 | 40 |
| 90.7 | 50 |
| 84.7 | 60 |
| Mix.(?) + Mix.(?) | |
| 82.5E | 63 |

B = $CHI_3$.—(*Continued*)

| °C ±0.5 | M % A |
|---|---|
| Mix.(?) | |
| 84.3 | 65 |
| 88.8 | 70 |
| 93.0 | 75 |
| 97.5 | 80 |
| 101.7 | 85 |
| 105.7 | 90 |
| 109.3 | 95 |
| **113** | **100** |
| $Mix_1$ + $Mix_2$ (168) | |
| 66.1E | 24.9 \| 53.2 |
| | 73.3 \| 53.2 |

B = $C_2Cl_4$ (80)
Tetrachloroethylene

| °C | s* |
|---|---|
| 25 | 0.241 |

B = $C_2HCl_5$ (80)
Pentachloroethane

| 25 | 0.272 |
|---|---|

B = $C_2H_2Cl_2$ (80)
Acetylene dichloride

| 25 | 0.312 |
|---|---|

B = $C_2H_2Cl_4$ (80)
1, 1, 2, 2-Tetrachloroethane

| 25 | 0.244 |
|---|---|

* s = solubility of A in g-mole per l solution (A + B).

B = $C_3H_6O$ (88)
Acetone

| °C | M % A ±0.02 |
|---|---|
| B(?)* | |
| −84 | 0.62 |
| −80 | 1.05 |
| −70 | 2.02 |
| −60 | 2.90 |
| (?) + (?) | |
| −54.75U | 3.33 |
| °C | M % A ±0.08 |
| A(?)* | |
| −52.5 | 2.85 |
| −50 | 2.50 |
| −45 | 2.05 |
| −40 | 1.73 |
| −35 | 1.49 |
| −30 | 1.28 |
| −25 | 1.11 |
| −20 | 0.96 |
| −15 | 0.84 |
| −10 | 0.72 |
| − 5 | 0.63 |
| 0 | 0.54 |

* Mixed crystals (?).

B = $C_4H_{10}O$ (8, 88, 109)
Ethyl ether

| °C | M % A ±0.08 |
|---|---|
| A | |
| −108 | 4.22 |
| −100 | 4.26 |
| − 90 | 4.30 |
| − 80 | 4.35 |

B = $C_4H_{10}O$.—(*Continued*)

| °C | M % A ±0.08 |
|---|---|
| A | |
| −70 | 4.43 |
| −60 | 4.54 |
| −50 | 4.70 |
| −40 | 4.92 |
| −30 | 5.23 |
| −25 | 5.43 |
| −20 | 5.66 |
| −15 | 5.96 |
| −10 | 6.31 |
| − 5 | 6.68 |
| 0 | 7.07 |
| +25 | 9.29 |

B = $C_4H_{12}IN$ (121)
Tetramethylammonium iodide

| °C ±0.2 | M % B |
|---|---|
| A | |
| **112** | **0** |
| 105 | 5.0 |
| 98 | 10.0 |
| A + $A_4B$(?) | |
| 91E | 14.75 |
| $A_4B$(?) | |
| 92 | 15.0 |
| 98 | 16.0 |
| 103.5 | 17.0 |
| 106.0 | 18.0 |
| 106.5 | 19.0 |
| **106.4** | **20.0** |
| 105.0 | 21.0 |
| 102.5 | 22.0 |
| $A_4B$(?) + $A_3B$(?) | |
| 98.5E | 22.75 |
| $A_3B$(?) | |
| 98.5 | 23 0 |
| 98.4 | 24.0 |
| **98.3** | **25.0** |
| 98.2 | 26.0 |
| $A_3B$(?) + $A_2B$ | |
| 98.2E | 26.5 |
| $A_2B$ | |
| 105.0 | 27.0 |
| 114 5 | 28.0 |
| 122.0 | 29.0 |
| 124.5 | 30.0 |
| 125.5 | 31.0 |
| 126.0 | 32.0 |
| **126.0** | **33.3** |
| 124.2 | 35.0 |
| 119.5 | 37.5 |
| 111.0 | 40.0 |
| $A_2B$ + AB | |
| 99.0E | 42.5 |
| AB | |
| 110.5 | 45.0 |
| 117.0 | 47.5 |
| **118.5** | **50.0** |
| 117.5 | 52.0 |
| (?) | |
| 117.6 | 55.0 |

$I_2$. — (*Continued*)

B = $C_6H_4Br_2$ (124)

*p*-Dibromobenzene

| °C ±0.5 | M % A |
|---|---|
| B* | |
| **88.5** | **0** |
| 86.3 | 5 |
| 84.4 | 10 |
| 82.7 | 15 |
| 79.5 | 20 |
| 77.0 | 25 |
| B* + A* | |
| 76.0E | 26.2 |
| A* | |
| 78.2 | 30 |
| 84.5 | 40 |
| 88.5 | 45 |
| 92.5 | 50 |
| 97.5 | 60 |
| 100.7 | 70 |
| 103.5 | 80 |
| 106.0 | 90 |
| **113** | **100** |

* Mixed crystals(?).

B = $C_6H_4N_2O_4$ (124)

*p*-Dinitrobenzene

| °C ±0.5 | M % A |
|---|---|
| B* | |
| **90.5** | **0** |
| 85.0 | 15 |
| B* + A* | |
| 83.5E | 19 |
| A* | |
| 87.0 | 20 |
| 93.5 | 22.5 |
| 98.5 | 25 |
| 103.0 | 27.5 |
| 107.5 | 30 |
| 109.2† | 31 |
| 109.2† | >94 |
| **113.5** | **100** |

* Mixed crystals(?).
† Two liq. layers.

B = $C_6H_6$ (5, 8, 85)

Benzene

| °C | M % A ±0.1 |
|---|---|
| B* | |
| **5.4** | **0** |
| 5.2 | 0.4 |
| B* + A* | |
| 4.6E | 2.55 |
| A* | |
| 10 | 3.07 |
| 15 | 3.60 |
| 20 | 4.20 |
| 25 | 4.82† |
| 30 | 5.50 |
| 35 | 6.80 |
| 40 | 7.18 |
| 45 | 8.20 |
| 50 | 9.5 |
| 51.6 | 10.0 |

* May be mixed crystals.
† 5.45 (5).

B = $C_6H_{14}$ (83, 85)

Hexane

| °C | M % A |
|---|---|
| A | |
| 25 | 4.5 ± 0.02 |

B = $C_7H_6O_2$ (124)

Benzoic acid

| °C ±0.5 | M % A |
|---|---|
| B* | |
| **122.8** | **0** |
| 111.8 | 20 |
| B* + A* | |
| 107.5E | 28 |
| A* | |
| 108.1 | 30 |
| 109.0 | 35 |
| 110.0 | 40 |
| 110.8 | 45 |
| 111.5† | 50 |
| 111.5† | >95 |
| **113** | **100** |

* Mixed crystals (?).
† Two liq. layers.

B = $C_7H_{16}$ (83, 85)

Heptane

| °C | M % A ±0.02 |
|---|---|
| A | |
| 0 | 0.245 |
| 10 | 0.376 |
| 20 | 0.565 |
| 25 | 0.679 |
| 40 | 1.19 |
| 50 | 1.70 |

B = $C_9H_{14}IN$ (121)

Trimethylphenyl-ammonium iodide

| °C ±0.2 | M % B |
|---|---|
| A | |
| **112** | **0** |
| 101.5 | 2.5 |
| 90.2 | 5.0 |
| 78.3 | 7.5 |
| 65.6 | 10.0 |
| 51.7 | 12.5 |
| A + $A_4B$ | |
| 45.0E | 13.7 |
| $A_4B$ | |
| 47.8 | 15.0 |
| 52.5 | 17.5 |
| 54.5 | 19.0 |
| **55.3** | **20.0** |
| 55.2 | 20.5 |
| $A_4B$ + $A_3B$ | |
| 55.1E | 21.2 |
| $A_3B$ | |
| 58.2 | 22.0 |
| 61.3 | 23.0 |
| 62.7 | 24.0 |
| **63.2** | **25.0** |
| $A_3B$ + $A_2B$ | |
| 63.0E | 26.0 |
| $A_2B$ | |
| 69.5 | 27.0 |
| 73.8 | 28.0 |
| 77.0 | 29.0 |
| 79.5 | 30.0 |

B = $C_9H_{14}IN$.—(*Continued*)

| °C ±0.2 | M % B |
|---|---|
| $A_2B$ | |
| 81.5 | 31.0 |
| 83.0 | 32.0 |
| **83.5** | **33.3** |
| 83.2 | 34.0 |
| 83.0 | 35.0 |
| 82.2 | 36.0 |
| 80.7 | 37.0 |
| $A_2B$ + AB | |
| 79.5E | 37.8 |
| AB | |
| 89.5 | 40.0 |
| 98.8 | 42.5 |
| 106.2 | 45.0 |
| 111.2 | 47.5 |
| **112.6** | **50.0** |
| 111.6 | 52.5 |
| 109.2 | 55.0 |
| 104.9 | 58.7 |

B = $C_{10}H_8$ (170)

Naphthalene

| °C | M % A |
|---|---|
| B + A | |
| 65.5E | 24.72 |

B = $C_{12}H_{10}N_2$ (124)

Azobenzene

| °C ±0.5 | M % A |
|---|---|
| B* | |
| **68.2** | **0** |
| 65.3 | 10 |
| 61.6 | 20 |
| B* + A* | |
| 57.2E | 30 |
| A* | |
| 64.0 | 32.5 |
| 72.5 | 35 |
| 80.0 | 37.5 |
| 85.5 | 40 |
| 89.0 | 42.5 |
| 91.5 | 45 |
| 94.5 | 50 |
| 96.7 | 55 |
| 98.2 | 60 |
| 100.3 | 70 |
| 102.3 | 80 |
| 105.5 | 90 |
| **113** | **100** |

* Mixed crystals(?).

B = $C_{14}H_{10}O_3$ (124)

Benzoic anhydride

| °C ±0.5 | M % A |
|---|---|
| B* | |
| **40.3** | **0** |
| 37.0 | 5.0 |
| B* + A* | |
| 36.7E | 5.3 |
| A* | |
| 42.5 | 7.5 |
| 50.0 | 10 |
| 62.5 | 15 |
| 73.0 | 20 |
| 81.5 | 25 |
| 88.3 | 30 |
| 94.3 | 35 |

B = $C_{14}H_{10}O_3$.—(*Continued*)

| °C ±0.5 | M % A |
|---|---|
| A* | |
| 99.5 | 40 |
| 104.2 | 45 |
| 108.2 | 50 |
| 110.2† | 52.5 |
| 110.2† | >90 |
| **113** | **100** |

* Mixed crystals(?). † Two liq. layers

$S_8$

B = $CCl_4$ (47, 86, 87)

| °C | M % A ±0.02 |
|---|---|
| A | |
| 0 | 0.203 |
| 10 | 0.294 |
| 15 | 0.355 |
| 20 | 0.425 |
| 25 | 0.500 |
| 35 | 0.697 |
| 40 | 0.812 |
| 45 | 0.944 |
| 50 | 1.085 |
| 54 | 1.212 |
| 60 | 1.420 |

B = $CS_2$ (5, 8, 45, 52, 88)

| °C | M % A* | A |
|---|---|---|
| −120 | | 0.85† |
| −110 | 0.30 | 1.00 |
| −100 | 0.44 | 1.15 |
| − 90 | 0.59 | 1.30 |
| − 80 | 0.75 | 1.45 |
| − 70 | 0.95 | 1.60 |
| − 60 | 1.22 | |
| − 50 | 1.60 | |
| − 40 | 2.10 | |
| − 30 | 2.75 | |
| − 20 | 3.60 | |
| − 10 | 4.60 | |
| 0 | 6.15 | |
| + 10 | 8.2 | |
| 20 | 10.8 | |
| 30 | 15.7 | |
| 40 | 22.0 | |
| 45 | 25.1 | |
| 47 | 28.5 | |
| 50 | 29.5 | |
| 60 | 35.0 | |
| 70 | 42.5 | |
| 80 | 52.0 | |
| 90 | 63.0 | |
| 100 | 77.0 | |

* ±<0.5 % (−11 to +55°) (45); ±<0.02 % (−13 to −109.50°) (88), ± <0.2 % (−61 to +100°) (52).
† Values in this column from (8).

B = $CH_2I_2$ (147)

Methylene iodide

| °C | M % A |
|---|---|
| A | |
| 10 | 9.46 |

B = $C_2Cl_4$ (87)

Tetrachloroethylene

| | |
|---|---|
| 25 | 0.9794 |

B = $C_2HCl_3$ (73, 87)
Trichloroethylene

| °C | M % A |
|---|---|
| 15 | 0.595 |
| 25 | 0.826 |

B = $C_2HCl_5$ (87)
Pentachloroethane

| 25 | 0.935 |
|---|---|

B = $C_2H_2Cl_2$ (87)
Acetylene dichloride

| 25 | 0.480 |
|---|---|

B = $C_2H_2Cl_4$ (87)
Tetrachloroethane

| 25 | 0.798 |
|---|---|

B = $C_2H_4Cl_2$ (86)
Ethylene chloride

| 25 | 0.322 |
|---|---|
| 40 | 0.537 |

B = $CHCl_3$ (30, 45, 47)

| °C | M % A ±0.02 |
|---|---|
| | A |
| 10 | 0.325 |
| 15 | 0.405 |
| 20 | 0.500 |
| 25 | 0.610 |

g A per 100 $cm^3$ solution

| °C | $S_m$* | $S_{rh}$† |
|---|---|---|
| 0 | 1.101 | 0.788 |
| 15.5 | 1.658 | 1.253 |
| 40 | 2.9 | 2.4 |

* m = monoclinic. † rh = rhombic.

B = $C_2H_4Br_2$ (52)
Ethylene bromide

| °C | M % A ±0.05 |
|---|---|
| | A |
| 0 | 0.48 |
| 10 | 0.575 |
| 20 | 0.760 |
| 25 | 0.885 |
| 30 | 1.05 |
| 40 | 1.48 |
| 50 | 2.19 |
| 60 | 3.02 |
| 70 | 4.18 |
| 80 | 5.92 |
| 90 | 9.00 |
| 95 | 12.6 |

B = $C_2H_5Br$ (30)
Ethyl bromide

| °C | $S_m$* | $S_o$* |
|---|---|---|
| 0 | 8.52 | 6.11 |
| 25.3 | 16.76 | 13.07 |

B = $C_2H_6O$ (30)
Ethyl alcohol

| 25.3 | 0.66 | 0.52 |
|---|---|---|

B = $C_3H_6O$ (78)
Acetone

| °C | M % A |
|---|---|
| 25.0 | 0.613 |

* Solubility of A in g per l solution. $S_m$ = monoclinic; $S_o$ = orthorhombic.

B = $C_3H_6O_2$ (30)
Ethyl formate

| °C | $S_m$* | $S_o$* |
|---|---|---|
| 0 | 0.28 | 0.19 |

B = $C_3H_8O_3$ (128)
Glycerol

| °C | M % A |
|---|---|
| 15.5 | 0.050 |

B = $C_4H_{10}O$
Ethyl ether

| °C (47) | M % A |
|---|---|
| 13.0 | 0.0543 |
| 23.0 | 0.0817 |

| °C(30) | $S_m$* | $S_o$* |
|---|---|---|
| 0 | 1.13 | 0.80 |
| 25.3 | 2.53 | 2.00 |

* Solubility of A in g per l solution. $S_m$ = monoclinic; $S_o$ = orthorhombic.

B = $C_4H_8Cl_2S$ (174)
Di-(2-chloroethyl) sulfide
(mustard gas)

| °C ±0.5 | M % A |
|---|---|
| | B |
| **13.82*** | **0** |
| 13.67* | 0.5 |
| | B + A(rh)† |
| 13.65E | 0.56 |
| | A(rh)† |
| 30.0 | 1.0 |
| 43.0 | 1.5 |
| 52.5 | 2.0 |
| 65.5 | 3.0 |
| 74.2 | 4.0 |
| | A(m)† |
| 80.8 | 5.0 |
| 85.7 | 6.0 |
| 92.5 | 8.0 |
| 97.2 | 10.0 |
| 101.2 | 12.5 |
| 104.0‡ | 14.5 |
| 104.0‡ | 85.0 |
| 107.5 | 90.0 |
| 110.7 | 95.0 |
| **113.0** | **100** |

| °C | M % A liq. layers | |
|---|---|---|
| | Upper | Lower |
| 104 | 14.5 | 85.0 |
| 110 | 17.3 | 83.5 |
| 115 | 19.5 | 81.7 |
| 120 | 21.8 | 79.7 |
| 125 | 24.0 | 77.0 |
| 130 | 26.7 | 73.6 |
| 135 | 30.8 | 68.7 |
| 143 crit. | 48.2 | 48.2 |

* ±0.01.
† (rh) = rhombic; (m) = monoclinic.
‡ Two liq. layers.

B = $C_5H_{12}O$ (66)
Amyl alcohol

| °C | M % A |
|---|---|
| | A |
| 95 | 0.51† |
| 110 | 0.73† |
| 112* | 0.80‡ |

B = $C_5H_{12}O$.—(*Continued*)

| °C | M % A |
|---|---|
| | A |
| 120* | 1.02‡ |
| 131* | 1.8‡ |

* Two liq. phases. † ±0.02 %.
‡ ±0.2 %.

B = $C_6H_4Cl_2$ (31)
*p*-Dichlorobenzene

| °C ±0.1 | M % A |
|---|---|
| | B |
| **52.9** | 0 |
| 51.55 | 3 |
| | B + A(rh)* |
| 51.0E | 4.2 |
| | A(rh)* |
| 67.8 | 6 |
| 81.5 | 10 |
| 90.0 | 15 |
| 94.8 | 20 |
| | A(m)* |
| 97.5† | 27 |
| 97.5† | 78.5 |
| **113.0** | **100** |

| °C | M % A liq. layers | |
|---|---|---|
| | Upper | Lower |
| 97.5 | 27 | 78 |
| 100.0 | 32 | 70 |
| 102.5 | 40 | 60 |
| 103.5 crit. | 46 | 46 |

* (rh) = rhombic; (m) = monoclinic. † Two liq. layers (±1°).

B = $C_6H_6$ (5, 30, 45, 47, 52, 86)
Benzene

| °C | M % A ±0.04 |
|---|---|
| | A |
| 0 | 0.31 |
| 10 | 0.43 |
| 20 | 0.60 |
| 30 | 0.84 |
| 40 | 1.13 |
| 50 | 1.50 |
| 60 | 2.00 |
| 70 | 2.77 |
| 80 | 3.80 |
| 90 | 5.00 |
| 100 | 6.50 |
| 110 | 8.6† |
| 113* | 11† |

| °C (52, 105) | M % A ± 2 % liq. layers | |
|---|---|---|
| | Upper | Lower |
| 120 | 11.5 | 65.5 |
| 130 | 14.5 | 62.0 |
| 140 | 18.0 | 58.0 |
| 150 | 22.5 | 53.0 |
| 162 crit. | 38.0 | 38.0 |
| (220 to 225) crit. | (40 to 45) | (40 to 45) |
| 230 | 27.5 | 54.5 |
| 240 | 21.7 | 58.0 |
| 250 | 18 | 59.5 |
| 260 | 16 | 60.5 |
| 270 | 14 | 62.0 |

* Two liq. layers (?).
† Less precision in these values.

B = $C_6H_7N$ (48)
Aniline

| °C | M % A |
|---|---|
| 130 | 23.6 |

B = $C_6H_{14}$ (52)
Hexane

| °C | M % A* |
|---|---|
| | A |
| − 20 | 0.0235 |
| − 10 | 0.041 |
| 0 | 0.0540 |
| + 10 | 0.080 |
| 20 | 0.100 |
| 25 | 0.112 |
| 50 | 0.25 |
| 68 | 0.434 |
| 130† | 1.81 |
| 142† | 2.14 |
| 184† | 2.98 |

* Relative precision ±1 % of values given.
† Liquid A.

B = $C_7H_8$ (47, 86)
Toluene

| °C | M % A ±0.025 |
|---|---|
| | A |
| 0 | 0.324 |
| 10 | 0.472 |
| 20 | 0.650 |
| 25 | 0.750 |
| 30 | 0.865 |
| 35 | 0.995 |
| 40 | 1.14 |
| 45 | 1.33 |
| 50 | 1.57 |
| 54 | 1.797 |
| 60 | 2.21* |
| 70 | 3.08* |
| 80 | 4.13* |
| 83.5 | 4.52 |

* Less precision in these values. A mixture of $x$ g A in 100 g A + B was heated at $t°$ for $n$ hours, cooled to 0° and stirred at 0° for one hour after addition of a trace of octahedral A. The solubility of A at 0° in these solutions follows (11):

| $x$ | M % A |
|---|---|
| $t°$ = 140; $n$ = 6 hr | |
| 3.4 | 0.427 |
| 6.2 | 0.514 |
| 9.2 | 0.595 |
| 22.0 | 0.982 |
| 27.6 | 1.184 |
| $t°$ = 150°; $n$ = 4 hr | |
| 3.6 | 0.449 |
| 6.6 | 0.543 |
| 10.6 | 0.650 |
| 22.6 | 1.083 |
| 30.1 | 1.300 |
| $t°$ = 160°; $n$ = 2 hr | |
| 3.2 | 0.449 |
| 6.2 | 0.558 |
| 15.0 | 0.874 |
| 21.6 | 1.109 |
| 30.0 | 1.338 |

### $S_8$.—(*Continued*)

B = $C_7H_{16}$ (86)
Heptane

| °C | M % A ±0.005 |
|---|---|
| | A |
| 0 | 0.048 |
| 10 | 0.080 |
| 20 | 0.120 |
| 25 | 0.141 |
| 35 | 0.201 |
| 45 | 0.274 |
| 54 | 0.363 |

B = $C_8H_{10}$ (86)
*m*-Xylene

| °C | M % A |
|---|---|
| | A |
| 25 | 0.825 |
| 30 | 0.96* |
| 40 | 1.31* |
| 45 | 1.523 |
| 50 | 1.81* |
| 60 | 2.49* |
| 70 | 3.41* |
| 80 | 4.53 |

* Interpolated, assuming curve is similar to that in toluene.

### $Se_8$

B = $CS_2$ (148); *cf.* (107, 108)

| °C | M % A |
|---|---|
| | A |
| 25 | 86* |
| 25 | 49† |

* Amorphous.
† Hexagonal.

### $P_4$

B = $CS_2$ (44, 68)

| °C | M % A ±1 |
|---|---|
| | A |
| −80 | 2.7 |
| −50 | 6.3 |
| −25 | 11.7 |
| −20 | 13.5 |
| −15 | 16.5 |
| −10 | 21.5 |
| − 7.5 | 25.0 |

B = $CS_2$.—(*Continued*)

| °C | M % A ±1 |
|---|---|
| | A |
| − 5 | 31.0 |
| − 3.5 | 55.0 |
| − 3.0 | 61.0 |
| − 2 | 70.0 |
| 0 | 74.0 |
| + 2.5 | 78.0 |
| 5 | 80.5 |
| 10 | 83 |
| 25 | 89 |

| °C ±0.5 | M % A (84) |
|---|---|
| No solid phase, two liq. layers | |
| −7.9 | 5 |
| −7.0 | 25 |
| −6.7 | 35 |
| −6.4 | 50 |
| −6.4 | 60 |
| −6.6 | 75 |

From these data, a satd. soln. of A in B is stable below −7° and metastable above −7° while the two liq. layers are metastable below −7°.

B = $C_6H_6$ (69)
Benzene

| °C | M % A ±0.1 |
|---|---|
| 5 | 0.36 |
| 10 | 0.72 |
| 20 | 1.43 |
| 30 | 2.16 |
| 40 | (2.87) |
| 50 | (3.60) |
| 60 | 4.32 |
| 70 | 5.04 |
| 80 | 5.76 |
| 90 | 6.48 |
| 100 | 7.21 |
| 110 | 7.93 |
| 115 | 8.30 |

M % A = 0.0722*t*. No original data between 36° and 58° are given, but it is probable that at >44° two liq. phases are present.

## Sec. 4. Cryoscopic Data. Freezing-Point Lowering, $\Delta t$.

A = Solvent; B = Solute

Both in standard (resp. ℃-) arrangement (*v.* Vol. III, p. viii)

### $Cl_2$

B = $CCl_4$ (171)

| $\Delta t$°C ±0.0025 | M % B |
|---|---|
| 0.208 | 0.50 |
| 0.417 | 1.00 |
| 0.625 | 1.50 |
| 0.833 | 2.00 |

$\Delta t° = 0.417$ M % B.

B = $CHCl_3$ (171)

| $\Delta t$°C ±0.01 | M % B |
|---|---|
| 0.213 | 0.50 |
| 0.430 | 1.00 |
| 0.645 | 1.50 |
| 0.860 | 2.00 |

$\Delta t° = 0.430$ M % B.

B = $CH_4O$ (171)
Methyl alcohol

| $\Delta t$°C ±0.005 | M % B |
|---|---|
| 0.029 | 0.50 |
| 0.058 | 1.00 |
| 0.087 | 1.50 |
| 0.116 | 2.00 |
| 0.145 | 2.50 |
| 0.175 | 3.00 |
| 0.232 | 4.00 |
| 0.290 | 5.00 |

$\Delta t° = 0.058$ M % B.

B = $C_2H_6O$ (171)
Ethyl alcohol

| $\Delta t$°C ±0.005 | M % B |
|---|---|
| 0.065 | 0.50 |
| 0.120 | 1.00 |
| 0.168 | 1.50 |
| 0.207 | 2.00 |
| 0.244 | 2.50 |
| 0.280 | 3.00 |
| 0.355 | 4.00 |
| 0.450 | 5.00 |

B = $C_3H_6O$ (171)
Acetone

| $\Delta t$°C ±0.0025 | M % B |
|---|---|
| 0.197 | 0.50 |
| 0 380 | 1.00 |
| 0.545 | 1.50 |
| 0.700 | 2.00 |
| 0.850 | 2.50 |

B = $C_4H_8O_2$ (171)
Ethyl acetate

| $\Delta t$°C ±0.005 | M % B |
|---|---|
| 0.192 | 0.50 |
| 0.388 | 1.00 |
| 0.588 | 1.50 |
| 0.800 | 2.00 |

B = $C_4H_{10}O$ (171)
Ethyl ether

| $\Delta t$°C ±0.0025 | M % B |
|---|---|
| 0.208 | 0.50 |
| 0.417 | 1.00 |
| 0.625 | 1.50 |
| 0.832 | 2.00 |

$\Delta t° = 0.416$ M % B.

B = $C_7H_8$ (171)
Toluene

| $\Delta t$°C ±0.005 | M % B |
|---|---|
| 0.217 | 0.50 |
| 0.433 | 1.00 |
| 0.650 | 1.50 |

$\Delta t° = 0.433$ M % B.

B = $SnCl_4$ (171)

| $\Delta t$°C ±0.02 | M % B |
|---|---|
| 0.036 | 1.0 |
| 0.071 | 2.0 |
| 0.103 | 3.0 |
| 0.132 | 4.0 |
| 0.160 | 5.0 |
| 0.192 | 6.0 |
| 0.230 | 7.0 |
| 0.268 | 8.0 |
| 0.305 | 9.0 |

B = $SnCl_4$.—(*Continued*)

| $\Delta t$°C ±0.02 | M % B |
|---|---|
| 0.343 | 10.0 |
| 0.380 | 11.0 |
| 0.400 | 11.5 |

### $Br_2$

B = $S_2Br_2$ (57)

| $\Delta t$°C ±0.05 | M % B |
|---|---|
| 1.125 | 0.5 |
| 2.250 | 1.0 |

$\Delta t° = 2.25$ M % B.

B = $PBr_5$ (57)

| $\Delta t$°C ±0.005 | M % B |
|---|---|
| 0.215 | 0.5 |
| 0.357 | 1.0 |
| 0.400 | 1.5 |
| 0.475 | 2.0 |
| 0.645 | 3.0 |
| 0.75 | 4.0 |

B = $AsBr_3$ (57)

| $\Delta t$°C ±0.005 | M % B |
|---|---|
| 0.0266 | 0.5 |
| 0.533 | 1.0 |
| 0.800 | 1.5 |

$\Delta t° = 0.533$ M % B.

B = $SbBr_3$ (57)

| $\Delta t$°C ±0.02 | M % B |
|---|---|
| 0.250 | 0.5 |
| 0.510 | 1.0 |
| 0.790 | 1.5 |
| 1.080 | 2.0 |
| 1.695 | 3.0 |
| 2.335 | 4.0 |
| 3.725 | 6.0 |
| 5.08 | 8.0 |

B = $CCl_4$ (57)

| $\Delta t$°C ±0.005 | M % B |
|---|---|
| 1.333 | 2.5 |

B = $C_2H_5NO$ (57)
Acetamide

| $\Delta t$°C ±0.005* | M % B |
|---|---|
| 0.080 | 1.0 |
| 0.120 | 2.0 |
| 0.140 | 3.0 |
| 0.156 | 4.0 |
| 0.180 | 5.0 |
| 0.236 | 6.0 |
| 0.323 | 7.0 |
| 0.448 | 8.0 |
| 0.605 | 9.0 |
| 0.83 | 10.0 |
| 1.17 | 11.0 |
| 1.63 | 12.0 |
| 2.25 | 13.0 |
| 2.63 | 13.5 |

* From 0–10 M % B.

B = $AlBr_3$ (57)

| $\Delta t$°C ±0.005 | M % B |
|---|---|
| 0.138 | 0.5 |
| 0.276 | 1.0 |
| 0.414 | 1.5 |

$\Delta t° = 0.276$ M % B.

## $Br_2$

### B = HBr (144)

| $\Delta t$°C ±0.01 | M % A |
|---|---|
| 0.20 | 0.15 |
| 0.33 | 0.25 |
| 0.64 | 0.50 |
| 0.765 | 0.60 |

## I

### B = S

| $\Delta t$ °C* | M % B (127) |
|---|---|
| 0.30 | 1.00 |
| 0.55 | 2.00 |
| 1.20 | 5.00 |
| 1.74 | 7.50 |
| 2.30 | 10.00 |
| 3.64 | 15.00 |
| 0.18 | 1.50 † |
| 0.30 | 2.00 † |
| 0.52 | 3.00 † |
| 0.76 | 4.00 † |
| 0.17 | 2.00 ‡ |
| 0.39 | 3.00 ‡ |
| 0.61 | 4.00 ‡ |

* ±0.01.
† Precipitated (18).
‡ Plastic (18).

### B = Se (18, 119, 123, 127)

| $\Delta t$ °C* | M % B |
|---|---|
| 0.25 | 0.2 |
| 0.47 | 0.4 |
| 0.68 | 0.6 |
| 0.88 | 0.8 |
| 1.07 | 1.0 |
| 1.54 | 1.5 |
| 2.00 | 2.0 |
| 2.90 | 3.0 |
| 3.84 | 4.0 |
| 4.70 | 5.0 |
| 5.55 | 6.0 |
| 6.40 | 7.0 |
| 7.30 | 8.0 |
| 8.15 | 9.0 |
| 9.05 | 10.0 |
| 10.0 | 11.0 |

* ±0.02 (0.25 – 2.90°); ±0.05 (3.84 – 10.0°).

### B = Te (18, 127)

| $\Delta t$ °C* | M % B |
|---|---|
| 0.70 | 0.50 |
| 0.89m(?) | 0.70 |
| 1.10m(?) | 0.90 |
| 1.26m(?) | 1.10 |

* ±0.02.

### B = P (18)

| $\Delta t$°C ±0.02 | M % B |
|---|---|
| 1.210 | 1.50 |

For <1.50 M % B, $\Delta t$° = 0.8067 M % B

## $I_2$

### B = $NH_4I$ (127)

| $\Delta t$°C ±0.05 | M % B |
|---|---|
| 0.64 | 1.0 |
| 1.20 | 2.0 |
| 1.86 | 3.0 |

### B = $NH_4I$.—(*Continued*)

| $\Delta t$°C ±0.05 | M % B |
|---|---|
| 2.65 | 4.0 |
| 3.57 | 5.0 |
| 4.75 | 6.0 |

### B = $AsI_3$ or $SbI_3$ (126)

### B = $CHI_3$ (126, 127)

| $\Delta t$°C ±0.01 | M % B |
|---|---|
| 0.408 | 0.5 |
| 0.816 | 1.0 |
| 1.230 | 1.5 |
| 1.640 | 2.0 |
| 2.040 | 2.5 |

### B = $C_3H_5IO_2$ (126, 127)

β-Iodopropionic acid

| $\Delta t$°C ±0.01 | M % B |
|---|---|
| 0.300 | 0.5 |
| 0.540 | 1.0 |
| 0.745 | 1.5 |
| 0.930 | 2.0 |
| 1.105 | 2.5 |
| 1.285 | 3.0 |
| 1.605 | 4.0 |
| 1.880 | 5.0 |

### B = $C_4H_{12}IN$ (126, 127)

Tetramethylammonium iodide

| $\Delta t$°C ±0.01 | M % B |
|---|---|
| 0.08 | 0.1 |
| 0.185 | 0.25 |
| 0.355 | 0.5 |
| 0.655 | 1.0 |
| 0.980 | 1.5 |
| 1.360 | 2.0 |
| 1.835 | 2.5 |
| 2.355 | 3.0 |
| 3.615 | 4.0 |
| 4.45 | 4.5 |

### B = $C_6H_4Br_2$ (126, 127)

*p*-Dibromobenzene

| $\Delta t$°C ±0.03 | M % B |
|---|---|
| 0.408 | 0.5 |
| 0.800 | 1.0 |
| 1.185 | 1.5 |
| 1.555 | 2.0 |
| 1.915 | 2.5 |
| 2.26 | 3.0 |
| 2.91 | 4.0 |
| 3.51 | 5.0 |
| 4.07 | 6.0 |

### B = $C_6H_4N_2O_4$ (126, 127)

*p*-Dinitrobenzene

| $\Delta t$°C ±0.01 | M % B |
|---|---|
| 0.408 | 0.5 |
| 0.800 | 1.0 |
| 1.17 | 1.5 |

### B = $C_6H_6$ (166)

| $\Delta t$°C | M % A |
|---|---|
| 0.178 | 0.350 |

### B = $C_6H_8IN$ (126, 127)

Aniline hydroiodide

| $\Delta t$°C ±0.01 | M % B |
|---|---|
| 0.08 | 0.1 |
| 0.185 | 0.25 |
| 0.355 | 0.5 |
| 0.655 | 1.0 |
| 0.970 | 1.5 |
| 1.335 | 2.0 |
| 1.740 | 2.5 |
| 2.175 | 3.0 |
| 3.19 | 4.0 |
| 4.50 | 5.0 |

### B = $C_7H_6O_2$ (126, 127)

Benzoic acid

| | |
|---|---|
| 0.315 | 0.5 |
| 0.525 | 1.0 |
| 0.695 | 1.5 |
| 0.845 | 2.0 |
| 0.985 | 2.5 |

### B = $C_9H_{14}IN$ (126, 127)

Trimethylphenylammonium iodide

| | |
|---|---|
| 0.08 | 0.1 |
| 0.175 | 0.25 |
| 0 335 | 0.5 |
| 0.670 | 1.0 |
| 1.035 | 1.5 |
| 1.465 | 2.0 |
| 1.948 | 2.5 |
| 2.550 | 3.0 |
| 3.300 | 3.5 |
| 4.090 | 4.0 |
| 4.960 | 4.5 |
| 8.28 | 6.0 |
| 11.28 | 7.0 |

### B = $C_{10}H_8$ (126, 127)

Naphthalene

| | |
|---|---|
| 0.408 | 0.5 |
| 0.800 | 1.0 |
| 1.185 | 1.5 |
| 1.555 | 2.0 |
| 1.910 | 2.5 |

### B = $C_{10}H_{16}IN$ (126, 127)

Trimethyltoluylammonium iodide

| | |
|---|---|
| 0.08 | 0.1 |
| 0.175 | 0.25 |
| 0.335 | 0.5 |
| 0.670 | 1.0 |
| 1.035 | 1.5 |
| 1.470 | 2.0 |
| 1.950 | 2.5 |
| 2.7 | 3.0 |

### B = $C_{12}H_{10}$ (52)

Diphenyl

| $\Delta t$°C ±0.02 | M % B |
|---|---|
| 0.408 | 0.5 |
| 0.800 | 1.0 |
| 1.175 | 1.5 |
| 1.520 | 2.0 |
| 1.845 | 2.5 |
| 2.155 | 3.0 |
| 2.45 | 3.5 |

### B = $C_{12}H_{10}N_2$ (126, 127)

Azobenzene

| $\Delta t$°C ±0.02 | M % B |
|---|---|
| 0.408 | 0.5 |
| 0.800 | 1.0 |
| 1.185 | 1.5 |

### B = $C_{14}H_8O_2$ (126, 127)

Phenanthraquinone

| | |
|---|---|
| 0.370 | 0.5 |
| 0.670 | 1.0 |
| 0.925 | 1.5 |
| 1.115 | 2.0 |
| 1.250 | 2.5 |

### B = $C_{14}H_{10}O_3$ (126, 127)

Benzoic anhydride

| $\Delta t$°C | M % B |
|---|---|
| 0.390* | 0.5 |
| 0.730† | 1.0 |
| 1.025* | 1.5 |
| 1.25* | 2.0 |
| 1.36† | 2.5 |
| 1.46† | 3.0 |

* ±0.01. † ±0.05.

### B = $SnI_4$ or $HgI_2$ (126)

### B = KI (127)

| $\Delta t$°C ±0.05 | M % B |
|---|---|
| 0.67 | 1.0 |
| 1.34 | 2.0 |
| 2.00 | 3.0 |
| 2.74 | 4.0 |
| 3.68 | 5.0 |
| 4.75 | 6.0 |
| 6.00 | 7.0 |

### B = RbI (127)

| | |
|---|---|
| 0.67 | 1.0 |
| 1.34 | 2.0 |
| 2.00 | 3.0 |
| 2.90 | 4.0 |
| 4.05 | 5.0 |
| 5.30 | 6.0 |

## S

### B = I (18)

| $\Delta t$°C ±0.01 | M % B |
|---|---|
| 0.758 | 0.2335 |

## $S_8$

### B = $SeCl_4$ (19)

| $\Delta t$°C | M % B |
|---|---|
| 0.63 | 0.520 |
| 0.51 | 0.468 |
| 0.52 | 0.476 |
| 0.67 | 0.413 |
| 0.49 | 0.511 |
| 0.46 | 0.525 |

### B = $As_2S_3$ (19)

| | |
|---|---|
| 0.194 | 0.212 |
| 0.095 | 0.204 |
| 0.077 | 0.213 |
| 0.194 | 0.206 |
| 0.070 | 0.145 |
| 0.185 | 0.274 |
| 0.107 | 0.271 |

### B = $CHBr_3$ (19)

| | |
|---|---|
| 0.90 ±0.1 | 1 |

### $S_8$—(*Continued*)

B = $C_6H_4O_2S$ [19]
Thiophenecarboxylic acid

| $\Delta t$°C | M % B |
|---|---|
| 0.49 | 1 |

B = $C_6H_7N$ [19]
Aniline

| $\Delta t$°C | M % B |
|---|---|
| 0.663 | 1 |

B = $C_7H_5NS$ [19]
Phenyl isothiocyanate

| $\Delta t$°C | M % B |
|---|---|
| 0.90 | 1 |

B = $C_7H_8O$ [19]
*p*-Cresol

| $\Delta t$°C | M % B |
|---|---|
| 0.747 | 1 |

B = $C_9H_7N$ [19]
Quinoline

| $\Delta t$°C | M % B |
|---|---|
| 0.84 | 1 |

B = $C_{10}H_8$ [19]
Naphthalene

| $\Delta t$°C | M % B |
|---|---|
| 0.84 | 1 |

B = $C_{10}H_8O$ [19]
β-Naphthol

| $\Delta t$°C | M % B |
|---|---|
| 0.813 | 1 |

B = $C_{10}H_{14}O$ [19]
Thymol

| $\Delta t$°C | M % B |
|---|---|
| 0.82 | 1 |

B = $C_{11}H_8O_2$ [19]
α-Naphthoic acid

| $\Delta t$°C | M % B |
|---|---|
| 0.533 | 1 |

B = $C_{12}H_{10}$ [19]
Diphenyl

| $\Delta t$°C | M % B |
|---|---|
| 0.84 | 1 |

### $P_4$

B = $Se_8$ [14]

| $\Delta t$°C* | M % B |
|---|---|
| 0.166 | 0.05 |
| 0.332 | 0.10 |
| 0.500 | 0.15 |

$\Delta t \div$ M % B = 3.32.
* ±0.01.

### $SbCl_5$

B = $Cl_2$ [115]

| $\Delta t$°C ±0.05 | M % B |
|---|---|
| 1.22 | 2.0 |
| 2.38 | 4.0 |
| 3.62 | 6.0 |
| 5.00 | 8.0 |
| 5.83 | 9.0 |
| 6.35 | 9.5 |

B = $Br_2$ [115]

| $\Delta t$°C | M % B |
|---|---|
| 1.262 | 1.91 |
| 2.745 | 4.17 |
| 4.275 | 6.50 |

$\Delta t$° is a linear function of M % B to ±0.005°.
$\Delta t$° = 0.658 M % B.

B = $I_2$ [115]

| $\Delta t$°C | M % B |
|---|---|
| 0.602 | 0.347 |
| 1.650 | 0.962 |
| 2.215 | 1.296 |

### $I_2$.—(*Continued*)

$\Delta t$° = 1.709 M % B to ±0.005.

### $CHBr_3$

B = $I_2$ [166]

| $\Delta t$°C ±0.02 | M % B |
|---|---|
| 0.275 | 0.5 |
| 0.550 | 1.0 |
| 0.827 | 1.5 |
| 1.105 | 2.0 |
| 1.380 | 2.5 |

$\Delta t$° = 0.552 M % B.

### $CH_2I_2$

B = $I_2$ [16]

| $\Delta t$°C | M % B |
|---|---|
| 0.173 | 0.35 |

### $C_{14}H_8O_2$

Anthraquinone
B = $S_8$ [18]

| $\Delta t$°C ±0.01 | M % B |
|---|---|
| 0.415 | 0.5 |
| 0.800 | 1.0 |
| 1.500 | 2.0 |
| 2.150 | 3.0 |
| 2.475 | 3.5 |

B = $Se_8$ [18]

| $\Delta t$°C ±0.005 | M % B |
|---|---|
| 0.075 | 0.1 |
| 0.150 | 0.2 |
| 0.225 | 0.3 |

$\Delta t$° = 0.75 M % B.

### $HgCl_2$

B = $S_8$ [122]

| $\Delta t$°C ±0.005 | M % B |
|---|---|
| 0.320 | 0.25 |
| 0.645 | 0.50 |
| 0.955 | 0.75 |
| 1.245 | 1.00 |
| 1.530 | 1.27 |

B = $Se_8$ [122]

| $\Delta t$°C | M % B |
|---|---|
| 0.15* | 0.05 |
| 0.27* | 0.1 |
| 0.47* | 0.2 |
| 0.645* | 0.3 |
| 0.805* | 0.4 |
| 0.88* | 0.5 |
| 1.33† | 0.75 |
| 1.66† | 1.0 |
| 2.33‡ | 1.5 |
| 3.00‡ | 2.0 |

The mol. of Se in liq. B seems to be $Se_2$.
* ±0.02. † ±0.05. ‡ ±0.1.

### $HgBr_2$

B = $S_8$ [125]

| $\Delta t$°C ±0.005 | M % B |
|---|---|
| 0.55 | 0.5 |
| 1.11 | 1.0 |
| 1.65 | 1.5 |
| 2.16 | 2.0 |
| 2.66 | 2.5 |

### $S_8$.—(*Continued*)

| $\Delta t$°C ±0.005 | M % B |
|---|---|
| 3.14 | 3.0 |
| 3.50 | 3.5 |
| 4.01 | 4.0 |
| 4.40 | 4.5 |
| 4.93 | 5.3 |

B = $Se_8$ [125]

| $\Delta t$°C | M % B |
|---|---|
| 0.13* | 0.05 |
| 0.22* | 0.10 |
| 0.39† | 0.20 |
| 0.70† | 0.40 |

### $Se_8$.—(*Continued*)

| $\Delta t$°C | M % B |
|---|---|
| 0.99† | 0.60 |
| 1.265† | 0.80 |
| 1.53† | 1.0 |
| 2.66‡ | 2.0 |
| 3.84§ | 3.0 |
| 4.80§ | 4.0 |

The mol. of Se in liq. B seems to be $Se_2$.
* ±0.005. ‡ ±0.02.
† ±0.01. § ±0.05.

## THREE-COMPONENT SYSTEMS

### Bi

B = S [3, 4, 9, 14]
C = Te

*See* Fig. 5.
$E_1$ = A + $A_2C_3$.
$E_2$ = $A_2C_3$ + $A_4B_3C_3$.
$E_3$ = $A_2B_3$ + $A_4B_3C_3$.
$E_4$ = A + $A_2B_3$.
Ternary E (near 100 M % A) not determined.

For systems containing Fe, *v.* Vol. II, p. 449.

## LITERATURE

(For a key to the periodicals see end of volume)


(1) Abegg, Hamburger and Koppel, *93*, **50**: 403; 06. (2) Aikawa, *41*, **37**: 319; 16. *10*, **4**: 170; 21. (3) Amadori, *22*, **27 I**: 131; 18. (4) Amadori, *36*, **48 II**: 42; 18. (5) Amadori, *36*, **52 I**: 387; 22. (6) André, *27*, **33**: 1641; 23. (7) Arctowski, *93*, **6**: 260; 94. (8) Arctowksi, *93*, **11**: 272; 96. (9) Aten, *93*, **47**: 386; 05.

(10) Aten, *7*, **54**: 55; 05. (11) Aten, *64P*, **20**: 824; 18. (12) Bakhuis Roozeboom, *70*, **3**: 29; 84. (13) Bakhuis Roozeboom, *7*, **2**: 449; 88. (14) Beckmann, *7*, **22**: 609; 97. (15) Beckmann, *76*, **1913**: 886. (16) Beckmann and Faust, *93*, **84**: 103; 13. (17) Beckmann and Grünthal, *93*, **84**: 97; 13. (18) Beckmann and Hanslian, *93*, **80**: 221; 13. (19) Beckman and Platzmann, *93*, **102**: 215; 18.

(20) Biltz and Mecklenbourg, *93*, **64**: 226; 09. (21) Biltz and Meinecke, *93*, **131**: 1; 23. (22) Biltz and Wilke-Dörfurt, *93*, **48**: 297; 06. (23) Bissett, *4*, **105**: 1223; 14. (24) Bornemann, *192*, **5**: 13; 08. (25) Bornemann, *192*, **7**: 667; 10. (26) Boubnoff and Guye, *42*, **9**: 290; 11. (27) Boulouch, *34*, **135**: 165; 02. (28) Boulouch, *34*, **136**: 1577; 03. (29) Boulouch, *34*, **142**: 1045; 06. (29.5). Bouzat and Azinières, *34*, **177**: 1444; 23.

(30) Brönsted, *7*, **55**: 371; 06. (31) Bruni and Pelizzola, *22*, **30**: 159; 21. *10*, **5**: 117; 25. (32) Büchner and Karsten, *64V*, **11**: 504; 08. (33) Chikashige, *93*, **54**: 50; 07. (34) Chikashige, *93*, **72**: 109; 11. *429*, **3**: 109; 11. (35) Chikashige, *93*, **78**: 68; 12. *429*, **5**: 5; 12. (36) Chikashige and Aoki, *429*, **2**: 249; 17. (37) Chikashige and Fujita, *429*, **2**: 233; 17. (38) Chikashige and Hikosaka, *429*, **2**: 239; 17. (39) Chikashige and Kurosawa, *429*, **2**: 245; 17.

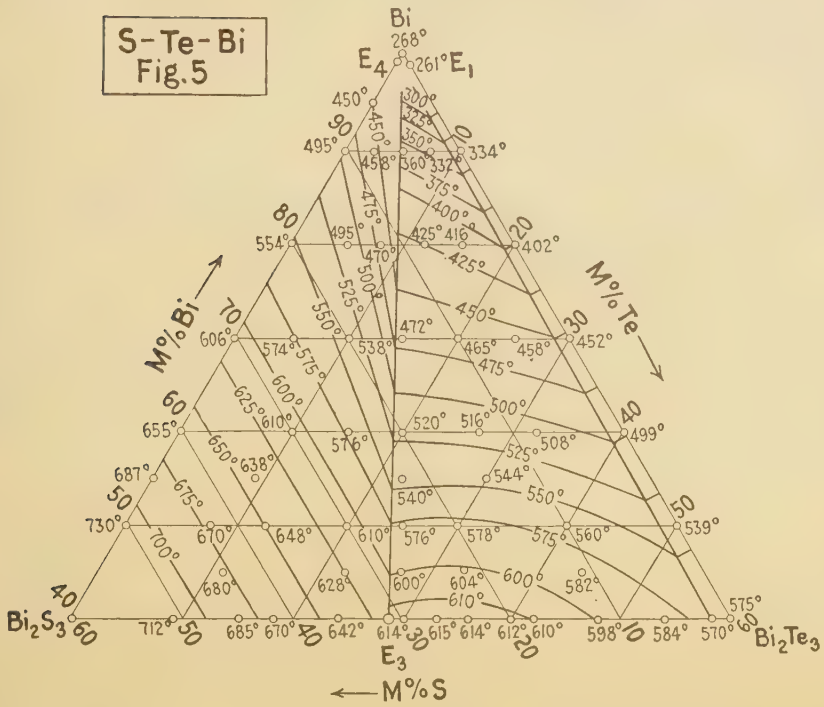
(40) Chikashige and Nosé, *429*, **2**: 227; 17. (41) Chikashige and Saito, *429*, **1**: 361; 16. (42) Chrétien, *34*, **142**: 1339; 06. (43) Chrétien, *34*, **142**: 1412; 06. (44) Cohen and Inouye, *7*, **72**: 411; 10. (45) Cossa, *25*, **1**: 138; 68. (46) Damiens, *6*, **19**: 44; 23. (47) Delaplace, *49*, **26**: 139; 22. (48) Doornbosch. *64V*, **20**: 516; 11. *93*, **75**: 265; 12. (48.5) Dorfman and Hildebrand, *1*. **49**: 729; 27. (49) Duncan, *347*, **22**: 544; 92.

(50) Eggink, *7*, **64**: 449; 08. (51) Ephraim, *93*, **38**: 338; 02 (52) Étard, *6*, **2**, 503; 94. (53) Fay, *1*, **29**: 1265; 07. (54) Fay and Ashley, *11*, **27**: 95; 02 (55) Fay and Gillson, *11*, **27**: 81; 02. (56) Fedotiev, *93*, **69**: 22; 11. (57) Finkelstein, *7*, **105**: 10; 23. (58) Fonzes-Diaçon, *34*, **130**: 1314; 00. (59) Friedrich, *192*, **5**: 212; 08.

(60) Friedrich, *192*, **5**: 593; 08. (61) Friedrich, *187*, **11**: 79; 14. (62) Friedrich and Leroux, *192*, **2**: 536; 05. (63) Friedrich and Leroux, *192*, **3**: 361; 06. (64) Friedrich and Leroux, *192*, **5**: 355; 08. (65) Friedrich and Waehlert, *187*, **10**: 976; 13. (66) Gérardin, *6*, **5**: 129; 65. (67) Gercke, *192*, **5**: 604; 08. (68) Giran, *51*, **2**: 208; 03. (69) Giran, *51*, **2**: 809; 03.

(70) Giran, *34*, **142**: 398; 06. (71) Giran, *34*, **159**: 246; 14. (72) van der Goot, *Diss.*, Amsterdam, 1911. (73) van der Goot, *7*, **84**: 419; 13. (74) Grimbert, Malmy and Poirot, *49*, **29**: 5; 24. (75) Guertler and Schack, *187*, **20**: 162, 23. (76) Guinchant, *34*, **134**: 1224; 02. (77) Hartley and Campbell, *4*, **93**: 741; 08. (78) Herz and Knock, *93*, **45**: 262; 05. (79) Herz and Paul, *93*, **85**: 214; 14.

(80) Herz and Rathmann, *9*, **19**: 887; 13. (81) Heyn and Bauer, *192*, **3**: 73; 06. (82) Heyn and Bauer, *93*, **52**: 129; 07. (83) Hildebrand, *1*, **39**: 2297; 17. (84) Hildebrand and Buehrer, *1*, **42**: 2213; 20. (85) Hildebrand and Jenks, *1*, **42**: 2180; 20. (86) Hildebrand and Jenks, *1*, **43**: 2172; 21. (87) Hoffmann




Kirmreuther and Thal, *25*, **43**: 183; 10. (88) Jacek, *165*, **1915**: 32. (89) Jaeger, *172*, **2**: 145; 09. *10*, **3**: 68; 14.

(90) Jaeger, *64V*, **20**: 498; 11. (91) Jaeger and Mencke, *64P*, **14**: 724; 12. *93*, **75**: 241; 12. **77**: 320; 12. (92) Jakovkin, *7*, **18**: 585; 95. (93) Jones and Hartmann, *1*, **37**: 241; 15. (94) Jonker, *93*, **62**: 89; 09. (95) Karsten, *93*, **53**: 365; 07. (96) Kimata, *429*, **1**: 119; 15. (97) Kimura, *429*, **1**: 149; 15. (98) van Klooster, *93*, **80**: 104; 13. (99) Kobayashi, *429*, **2**: 361; 10. *10*, **1**: 303; 12.

(100) Kobayashi, *93*, **69**: 1; 11. (101) Kobayashi, *95*, **2**: 65; 12. (102) Konstantinov, *93*, **60**: 405; 08. (103) Konstantinov and Smirnov, *169*, **23**: 715; 15. *10*, **4**: 170; 21. (104) Kremann and Schoulz, *57*, **33**: 1081; 12. (105) Kruyt, *7*, **65**: 480; 09. (106) Maass and McIntosh, *1*, **34**: 1273; 12. (107) Marc, *93*, **48**: 393; 06. (108) Marc, *93*, **53**: 298; 07. (109) Marden and Dover, *1*, **38**: 1235; 16.

(110) Marino and Becarelli, *22*, **21 II**: 685; 12. (111) Matignon, *34*, **130**: 1391; 00. (112) Matsumato, *41*, **37**: 324; 16. *10*, **4**: 170; 21. (113) McIntosh, *1*, **33**: 71; 11. (114) Mönkemeyer, *93*, **46**: 415; 05. (115) Moles, *7*, **90**: 70; 15. (116) Murakami, *429*, **1**: 153; 15. *10*, **4**: 170; 21. (117) Nosé, *41*, **37**: 296; 16. *10*, **4**: 170; 21. (118) Noyes and Seidensticker, *7*, **27**: 357; 98. *11*, **21**: 217; 99. (119) Olivari, *22*, **17 II**: 389; 08.

(120) Olivari, *22*, **17 II**: 512; 08. (121) Olivari, *22*, **17 II**: 717; 08. (122) Olivari, *22*, **18 II**: 94; 09. (123) Olivari, *22*, **18 II**: 264; 09. (124) Olivari, *22*, **20 I**: 470; 11. (125) Olivari, *22*, **21 I**: 718; 12. (126) Olivari, *22*, **22 II**: 697; 13. (127) Olivari, *22*, **23 I**: 41; 14. (128) Ossendovskii, *49*, **26**: 162; 07. *347*, **79**: 575; 07. (129) Parravano, *36*, **43 I**: 210; 13.

(130) Pelabon, *34*, **142**: 1147; 06. (131) Pelabon, *34*, **145**: 118; 07. (132) Pelabon, *6*, **17**: 526; 09. (133) Pelabon, *34*, **148**: 1176; 09. (134) Pellini, *36*, **40 I**: 380; 10. (135) Pellini, *36*, **40 II**: 42; 10. (136) Pellini, *36*, **45 I**: 533; 15. (137) Pellini and Pedrina, *22*, **17 II**: 78; 08. (138) Pellini and Quercigh, *22*, **19 II**: 350; 10. (139) Pellini and Quercigh, *22*, **19 II**: 415; 10.

(140) Pellini and Quercigh, *22*, **19 II**: 445; 10. (141) Pellini and Vio, *22*, **15 II**: 46; 06. (142) Quercigh, *24*, **70 II**: 671; 11. *10*, **2**: 67; 13. (143) Quercigh, *22*, **21 I**: 780; 12. (144) Reid and McIntosh, *1*, **38**: 615; 16. (145) Reinders and Lange, *64P*, **15**: 474; 10. (146) Reinders and Lange, *93*, **79**: 230; 13. (147) Retgers, *93*, **3**: 343; 93. (148) Ringer, *93*, **32**: 183; 02. (149) Rose, *432*, **17**: 285; 08.

(150) Ruff and Fischer, *25*, **36**: 418; 03. (151) Ruff and Hecht, *93*, **70**: 49; 11. (152) Ruff and Martin, *92*, **25**: 39; 12. (153) Ruff and Martin, *92*, **25**: 500; 12. (154) Ruff and Winterfeld, *25*, **36**: 2437; 03. (155) Saito, *41*, **37**: 282; 16. (155.5) Sammet, *7*, **53**: 641; 05. (156) Schoorl and Regenbogen, *233*, **56**: 538; 19. (157) Smith and Carson, *7*, **61**: 200; 08. (158) Smits and de Mooy, *64P*, **13**: 339; 10. (159) Stortenbecker, *70*, **7**: 141; 88.

(160) Stortenbecker, *7*, **3**: 11; 89. (161) Terwogt, *93*, **47**: 203; 05. (162) Thiel and Koelsch, *93*, **66**: 288; 10. (163) Thiel and Schulte, *7*, **96**: 312; 20. (164) Tomoshige, *429*, **4**: 57; 19. *10*, **5**: 114; 25. (165) Trautz and Dalal, *93*, **110**: 1; 20. (166) Turner and English, *4*, **105**: 1786; 14. (167) Urazov, *169*, **23**: 618; 15. *10*, **4**: 170; 21. (168) Vasiliev, *53*, **48**: 1784; 16. *10*, **5**: 117; 25. (169) Vasiliev, *53*, **49**: 88; 17. *10*, **5**: 117; 25.

(170) Vasilico, *Diss.*, Kazani, 1917. *10*, **5**: 117; 25. (171) Waentig and McIntosh, *69*, **9** No. **3**: 203; 16. (172) Walton and Whitford, *1*, **45**: 601; 23. (173) Wester and Bruins, *233*, **51**: 1443; 14. (174) Wilkinson, Neilson and Wylde, *1*, **42**: 1377; 20. (175) Winkler, *136*, **23**: 687; 99. (176) Wroczynski and Guye, *42*, **8**: 189; 10. (177) Zhemchuzhnui and Efremov, *93*, **57**: 241; 08. (178) Zhemchuzhnui and Schepeler, *93*, **64**: 254; 09.

# FREEZING-POINT—SOLUBILITY DATA FOR SYSTEMS COMPOSED OF A METAL AND AN INORGANIC COMPOUND

DOMENICO MENEGHINI

## Ca

B = $CaF_2$ (16, 17)
B = $CaCl_2$ (2, 17)
B = $CaI_2$ (8, 17)

## Na

B = NaOH (4)
Solubility of Na in NaOH

| t, °C | g A/100g B |
|---|---|
| 480 | 33.3 |
| 500 | 10.1 |
| 610 | 9.9 |
| 670 | 9.5 |
| 760 | 7.9 |
| 800 | 6.9 |

## K

B = KOH
g K dissolved by 100 g KOH = 8.0 at 480°: = 1.0 at 700° (4)

## Cd

B = $CdCl_2$ (1)

| t, °C | M % A ?* |
|---|---|
| 568 | 0.0 |
| 562 | 2.4 |
| 556 | 3.5 |
| 544 | 7.8 |
| 530 | 12.5 |
| 569 | 14.0 |
| 602 | 15.1 |
| 605 | 15.2 |
| 633 | 16.2 |
| 635 | 16.3 |

* The solid phase contains no $CdCl_2$.

## Cu

B = $Cu_2O$ (5)

| t, °C | Wt. % B Cu (?) |
|---|---|
| 1102 | 0.08 |
| 1095 | 1.16 |
| 1089 | 1.75 |
| Cu + $Cu_2O$ (?) | |
| 1084 | 3.45 |
| $Cu_2O$ (?) | |
| 1116 | 4.7 |
| 1149 | 6.3 |
| 1186 | 9.0 |

B = $SO_2$
0.0163 g-mole $SO_2$ in 100 g Cu lowers the M. P. 13.4°C. $p_{SO_2}$ = 1 atm. (15)

## Ag

B = $H_2O$
In 7 days 1.1 l of $H_2O$ dissolved *ca.* 0.009 mg Ag at room temp. (6)

B = AgF
Ag(s) + AgF(s) = $Ag_2F$(s) + 700 $cal_{15}$. The reaction begins at 50° and the compound is stable at 90° (3, 17)

## C (graphite)

B = Mn (11)
*See* Fig. 1
B = Co (13)
*See* Fig. 2
B = Ni (12)
*See* Fig. 3
B = W
*See* under W

## Pb

B = $SO_2$ (9)

B = $PbCl_2$ (7)

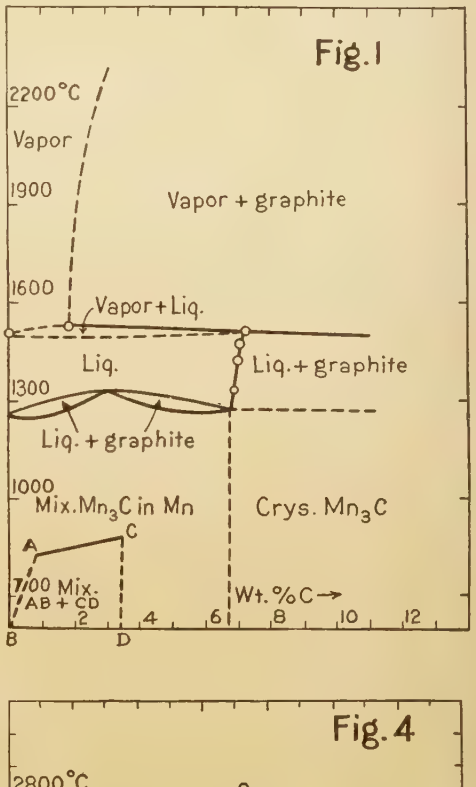
| t, °C | Wt. % A (?) |
|---|---|
| 550 | 1.54 |
| 610 | 3.74 |
| 615 | 4.10 |
| 670 | 7.46 |

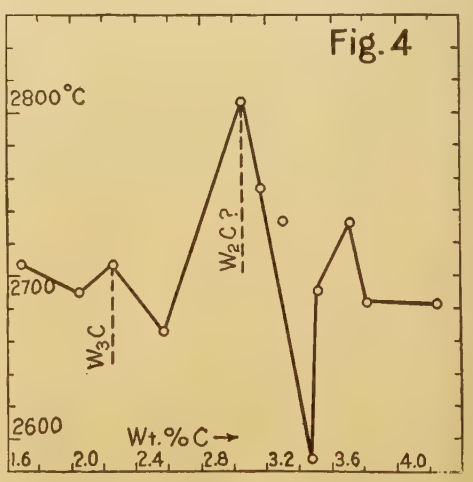
## Ni

B = NiO (10)

## W

B = $W_3C$ (14)
For 1% C in W the M. P. is lowered *ca.* 35°. The following carbides have been demonstrated: $W_3C$ with 2.12% C, ($W_2C$ with 3.16% C), WC with 6.12% C. The observed eutectics are W + $W_3C$ at 1.3% C and 2690°; at 2.4% C and 2660° formed from $W_3C$, WC and $W_2C$ (?); and WC + $W_2C$ at 3.5% C and 2580°. *See* Fig. 4

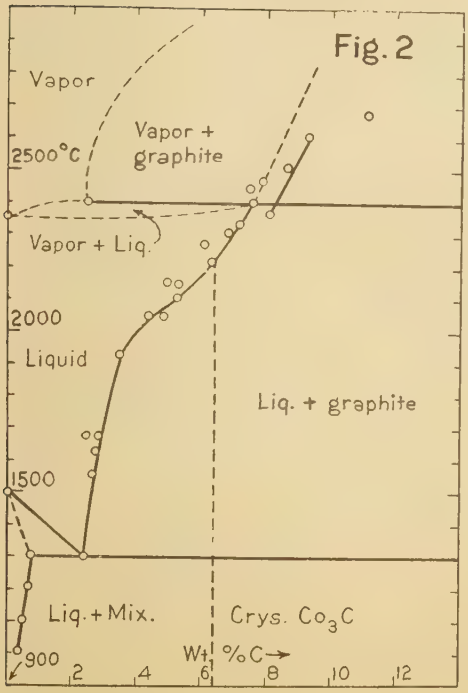


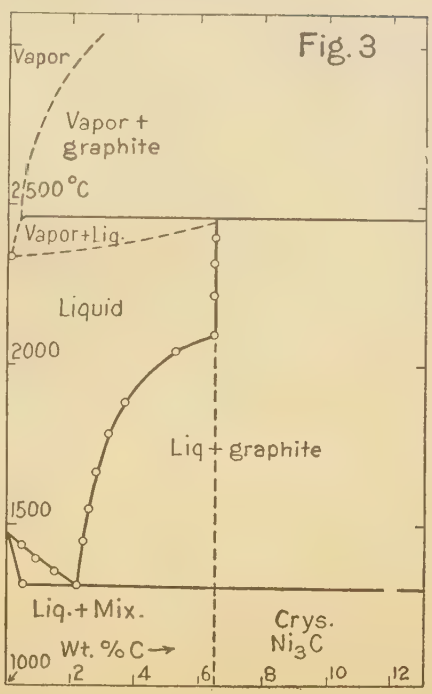




## LITERATURE

(For a key to the periodicals see end of volume)

(1) Aten, *7*, **73**: 578; 10. (2) Borchers and Stockem, *9*, **8**: 757; 02. (3) Guntz, *54*, **110**: 1337; 90. (4) Hevesy, *9*, **15**: 529; 09. (5) Heyn, *93*, **39**: 1; 04. (6) Krepelka and Toul, *362*, **19**: 182; 25. (7) Lorenz, Hevesy and Wolff, *7*, **76**: 732; 11. (8) Moissan, *6*, **18**: 289; 99. (9) Reinders, *93*, **93**: 213; 15.
(10) Ruer and Kaneko, *192*, **9**: 419; 12. (11) Ruff and Bormann, *93*, **88**: 365; 14. (12) Ruff and Bormann, *93*, **88**: 386; 14. (13) Ruff and Keilig, *93*, **88**: 410; 14. (14) Ruff and Wunsch, *93*, **85**: 292; 14. (15) Stubbs, *4*, **103**: 1445; 13. (16) Wöhler, and Kasernowski, *93*, **47**: 353; 05. (17) Wöhler and Rodewald, *93*, **61**: 54; 09.




# FREEZING-POINT—SOLUBILITY DATA FOR TWO- AND THREE-COMPONENT NON-AQUEOUS SYSTEMS COMPOSED OF INORGANIC COMPOUNDS ONLY AND INCLUDING ALL SYSTEMS COMPOSED OF FUSED SALTS*

CARLO SANDONNINI, UMBERTO SBORGI AND MARIO AMADORI†

**Abbreviations and Symbols;** *v. also* p. 4

Compositions on ternary-system diagrams are in Mol % unless otherwise stated.

$k_A$ (resp. $k_B$) $= \Delta t/N$ where $\Delta t$ is the freezing point lowering and $N$ the number of moles of solute B (resp. A) dissolved in 1000 g of the solvent A (resp. B) for values of $N$ up to the value given in the parentheses.

M. c. t. Melted in closed tube.

The pressure is atmospheric unless otherwise indicated.

**Abbréviations et Symboles;** *v. aussi* p. 4

Dans les diagrammes des systèmes ternaires, les compositions sont exprimées en % Mol à moins d'une autre indication.

$k_A$ (resp. $k_B$) $= \Delta t/N$, où $\Delta t$ est l'abaissement du point de congélation et $N$ le nombre de mol. gr. du corps dissout B (resp. A) dans 1000 g de solvant A (resp. B) pour des valeurs de $N$ jusqu'à celle donnée entre parenthéses.

M. c. t. Fondu en tube fermé.

Pression atmosphérique à moins d'une autre indication.

**Abkürzungen und Zeichen;** *siehe auch* S. 4

In den Diagramen ternärer Systeme ist, wenn nichts anderes bemerkt, die Zusammensetzung in Mol % angegeben.

$k_A$ (bezw. $k_B$) $= \Delta t/N$, ist $\Delta t$ die Gefrierpunkterniedrigung und $N$ die Molenzahl des gelösten Stoffes B (bezw. A) gelöst in 1000 g des Lösungsmittels A (bezw. B) für Werte von $N$ bis zu dem in der Klammer angegebenen Wert.

M. c. t. Geschmolzen in geschlossenen Röhre.

Druck immer atmosphärischer wenn nicht anderes bemerkt.

**Abbreviazioni e Simboli;** *vedi anche* p. 4

Le composizioni nei diagrammi ternari sono in Mol % quando non è indicato diversamente.

$k_A$ (risp. $k_B$) $= \Delta t/N$ dove $\Delta t$ è l'abbassamento del punto di congelamento ed $N$ il numero di moli di soluto B (oppure A) disciolto in 1000 g di solvente A (o B) per valori di $N$ fino al valore indicato fra parentesi.

M. c. t. Fuso in tubo chiuso.

Pressione atmosferica si non è indicato diversamente.

* Except systems composed of (*a*) two or three refractory substances or (*b*) of one or two refractory substances together with any metallic oxide. For such high temperature systems, *see* p. 83.

† Systems marked (S.) are by Umberto Sborgi, those marked (A.) by Mario Amadori, all others by Carlo Sandonnini.

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## 1. TWO-COMPONENT SYSTEMS

Standard Arrangement (*v.* Vol. III, p. viii)

### $H_2O_2$

B = $NH_3$ (153) (S.)

| *t*, °C | Wt. % B |
|---|---|
| A | |
| **− 1.72** | 0 |
| −13 | 3.41 |
| −18 | 4.31 |
| A + AB | |
| (−44) | (6) |
| AB | |
| + 5 | 18.05 |
| 15 | 21.1 |
| 22 | 25.2 |
| (25) | 27.7 |
| **(25)*** | 33.34 |
| + 9 | 48.6 |
| 0 | 50.7 |
| − 9.5 | 52.8 |
| −32 | 56.7 |
| −53.5 | 59.5 |
| <−78 | 61.3 |

* The authors give 24.5°.

B = NaCl (153) (S.)

| | |
|---|---|
| A | |
| **− 1.70** | 0 |
| − 5.07 | 5.42 |
| − 7.65 | 8.61 |
| −10.57 | 11.81 |
| A + B | |
| (−13.5)E | (15.5) |
| B | |
| −10.37 | 15.63 |
| >0 | 17 |

B = $Na_2SO_4$ (153) (S.)

| | |
|---|---|
| A | |
| **− 1.70** | 0 |
| − 4.27 | 6.92 |
| − 5.52 | 10.23 |
| − 9.02 | 16.77 |
| A + $BA_2$ | |
| −10.80E | 20.46 |
| $BA_2$ | |
| +19.6 | 22.64 |
| 29.1 | 23.59 |
| 39.1 | 25.62 |

B = $NaNO_3$ (153) (S.)

| | |
|---|---|
| A | |
| **−1.70** | 0 |
| −3.72 | 5.11 |
| −5.62 | 10.11 |
| −8.12 | 16.66 |
| −9.52 | 20.19 |

B = $NaNO_3$.— (*Continued*)

| *t*, °C | Wt. % B |
|---|---|
| A + B | |
| (−11)E | (23) |
| B | |
| +11.8 | 25.22 |
| 32.3 | 28.25 |
| 49.3 | 31.53 |

### HCl

B = $SO_2$ (26) (S.)

| *t*, °C | M % A |
|---|---|
| B | |
| **− 72** | 0 |
| − 76.5 | 8.9 |
| − 83.4 | 19.7 |
| − 88.1 | 28.2 |
| − 95.5 | 39.9 |
| −101.3 | 49.3 |
| −111.2 | 59.4 |
| −121.8 | 69.4 |
| B + A | |
| −133.4E | 79.3 |
| A | |
| −127.5 | 85.3 |
| −121.4 | 91.7 |
| **−112.0** | 100 |

B = $H_2S$ (25) (S.)

| | |
|---|---|
| Mix. | |
| **− 82.6** | 0 |
| − 92.3 | 13.7 |
| −100.9 | 24 |
| −107.9 | 32.6 |
| −110.4 | 39.2 |
| −111.4 | 44.9 |
| −114.7 | 55.2 |
| −115.3 | 57.6 |
| −115.6 | 61.0 |
| −116.3 | 63.7 |
| −117.2 | 67.8 |
| −117.4 | 71.3 |
| −117.3 | 76.2 |
| −116.9 | 80.7 |
| −116.3 | 86.6 |
| −115.7 | 91.5 |
| **−111.6** | 100 |

### HBr

B = $H_2S$ (22) (S.)

| | |
|---|---|
| Mix. | |
| **−82** | 0 |
| −83.5 | 10.7 |
| −85 | 18.2 |
| −86 | 25.0 |
| −86.7 | 31.0 |
| −87.0 | 35.7 |
| −87.0 | 39.8 |
| −87.0 | 44.2 |
| −87.0 | 49.0 |
| −87.5 | 51.5 |

B = $H_2S$.— (*Continued*)

| *t*, °C | M % A |
|---|---|
| Mix. | |
| −87.3 | 55.0 |
| −87.2 | 58.5 |
| −86.9 | 64.4 |
| −86.2 | 71.2 |
| −85.3 | 82.4 |
| **−83.1** | 100 |

### HI

B = $H_2S$ (22) (S.)

| | |
|---|---|
| Mix. | |
| **−82.0** | 0 |
| −87.0 | 11.3 |
| −89.0 | 20.3 |
| −90.8 | 28.4 |
| −90.7 | 35.6 |
| −89.0 | 41.0 |
| −87.0 | 51.0 |
| −83.0 | 56.0 |
| **−46** | 100 |

### ICl

B = $SbCl_5$

*v.* A = $SbCl_5$

### ICl$\alpha$

B = $CCl_4$ (175) (S.)

M. P. of A = 27.16°

$k_A$ = 10.5

### $SO_2$

B = $SO_2Cl_2$ (92) (S.)

| *t*, °C | M % B |
|---|---|
| A | |
| **−75.1** | 0 |
| −77.4 | 5.5 |
| −81.5 | 18.4 |
| A + B | |
| −84.5E | 28.5 |
| B | |
| −83.7 | 33 |
| −76.4 | 48.3 |
| −74.3 | 53.4 |
| −69.5 | 64.8 |
| −64.4 | 77.3 |
| −57.4 | 93.1 |
| **−54.1** | 100 |

B = $CO_2$ (251) (S.); *v.* Fig. 1

*P* = 750 mm

| | |
|---|---|
| B | |
| | No liq. |
| −78.61 | 99.72* |
| −78.643 | 33.6† |
| <−78.643 | <33.6 |
| Liq. | |
| −10.09 | 0 |

* % in gas, $p_A$ = 2.1 mm.
† % in soln.

B = $TiCl_4$ (281)

B = $SnCl_4$ (38); *cf.* (281) (S.)

| *t*, °C | Wt. % B |
|---|---|
| B | |
| −72.7 | 5.4 |
| −63.0 | 11.78 |
| −49.8 | 26.29 |
| −44.8 | 44.27 |
| −44.1 | 55.24 |
| −43.8 | 67.47 |
| −43.25 | 82.41 |
| −40.6 | 92.66 |
| **−32.7** | 100 |

Two metastable liq. layers

| | | |
|---|---|---|
| −57.5 | 31.96 | |
| −52.0 | | 86.16 |
| −46.3 | 50.76 | |
| −45.4 | | 75.76 |
| −44.9* | (71) | (71) |

* Critical soln. temp.

B = $SnBr_4$ (38); *cf.* (281) (S.)

| | | |
|---|---|---|
| B | | |
| −53.05 | | 0.39 |
| − 5.0 | | 5.37 |
| + 5.45 | | 10.61 |
| 16.3* | | 21.67 |
| Two liq. layers | | |
| −17.8m | 11.88 | |
| + 1.8m | 14.08 | |
| 16.3* | 21.67 | |
| 16.55* | | 94.07 |
| 25.00 | 26.09 | |
| 28.70 | | 91.65 |
| 39.75 | 40.63 | |
| 42.60 | | 85.54 |
| 46.30 | 52.83 | |
| 47.25 | | 80.31 |
| 48.6† | (71) | (71) |
| B | | |
| 18.80 | | 96.24 |
| 24.90 | | 98.74 |
| **29.45** | | 100 |

* Quadruple point.
† Critical soln. temp.

B = $SnI_4$ (281)

B = KI (268) (S.)

*v.* Fig. 2

| *t*, °C | M % B |
|---|---|
| A | |
| **−72.7** | 0 |
| A + $A_{14}B$ | |
| −73E | 0.336 |
| $A_{14}B$ | |
| −54.7 | 1.785 |
| −37.3 | 4.130 |
| **(−23)** | 7.00 |
| $A_{14}B$ + $A_4B$ | |
| −28.4E | 8.48 |

B = KI.— (*Continued*)

| *t*, °C | M % B |
|---|---|
| $A_4B$ | |
| −19.2 | 11.60 |
| − 2.5 | 17.93 |
| **+ 0.26** | 20 |
| $A_4B$ + B | |
| −1.8E | 21.5 |
| B | |
| +75.3 | 15.66 |
| 84.2 | 11.28 |
| 88.1 | 10* |
| 88.1 | 1.72* |
| 96.4 | 0.58 |

* Two liq. layers with following composition:

| *t*, °C | Wt. % B | |
|---|---|---|
| | Upper | Lower |
| 88 | 2.7 | 24.0 |
| 86 | 3.8 | 22.5 |
| 84 | 4.5 | 21.1 |
| 82 | 5.1 | 19.8 |
| 80 | 6.8 | 17.6 |
| 78 | 8.5 | 15 |
| 77.3 | 12 | |

For qualitative data on solubility of several salts at temperatures up to the critical temperature, *v.* (82).

### $H_2S$

B = $BF_3$ (88) (S.)

| *t*, °C | M % A |
|---|---|
| B | |
| **−128.5** | 0 |
| −139 | 11 |
| B + BA | |
| −148E | 22 |
| BA | |
| −142 | 30 |
| −138 | 40 |
| **−137** | 50 |
| BA + $BA_7$ | |
| −140E | 53 |
| $BA_7$ | |
| −126 | 60 |
| −104 | 80 |
| $BA_7$ + A | |
| − 99U | 87.5 |
| A | |
| − 92.5 | 90 |
| **− 82** | 100 |

B = $CO_2$ (251) (S.) *v.* Fig. 3

*P* = 750 mm

| *t*, °C | M % B |
|---|---|
| B | |
| −78.61 | No liq. |
| −82.06 | 75.3* in gas, 25.4 in soln. |
| <−82.06 | <25.4 |
| Liq. | |
| −62 | 0 |

* $p_A$ = 184 mm.

### $S_2O_5Cl_2$

B = $SO_3HCl$ (232) (S.)

| *t*, °C | Wt. % B |
|---|---|
| (?) | |
| **−37 to −37.5** | 0 |
| −36 to −41 | 1 |
| −37 to −42 | 5 |
| −38 to −41 | 9 |
| −39 to −43 | 18 |
| −39 to −45 | 30 |
| −43 to −47 | 48 |
| −47 to −50 | 63 |
| −61 to −66 | 89 |
| **−80 to −81** | 100 |

### $SeOCl_2$ (271) (S.)

*t* = 25°C

S. P. = solid phase

% = Wt. % in solution

| Solute (B) | % | S. P. |
|---|---|---|
| LiCl | 3.21 | B |
| NaCl | 0.57 | B |
| KCl | 2.89 | AB |
| RbCl | 3.56 | AB |
| CsCl | 3.83 | ? |
| $CuCl_2$ | <0.10 | B |
| AgCl | <0.10 | B |
| $MgCl_2$ | 4.96 | $A_3B$ |
| | | (?) |
| $CaCl_2$ | 6.11 | $A_3B$ |
| | | (?) |
| $SrCl_2$ | 5.17 | B |
| $BaCl_2$ | 3.95† | B |
| $InCl_2$ | 1.10 | B |
| $CdCl_2$ | 0.15 | B |
| $HgCl_2$ | 0.89 | B |
| $TiCl_4$ | 0.75 | $A_2B$ |
| $SnCl_4$ | 13.73 | $A_2B$ |
| $PbCl_2$ | <0.10 | B |
| $AsCl_3$ | * | |
| $SbCl_5$ | 38.64 | $A_2B$ |
| $CrCl_3$ | <0.10 | B |
| $MnCl_2$ | 0.16 | (?) |
| $FeCl_3$ | 23.40 | $A_2B$ |
| $NiCl_2$ | 0.15 | B |
| $CoCl_2$ | 0.17 | B |

* Miscible in all proportions.
† 2.35 at 40°; 1.23 at 55°; 0.71 at 70°.

### $H_2SO_4$

B = $(NH_4)_2SO_4$ (58, 133) (A.)

| *t*, °C | M % B |
|---|---|
| A | |
| **10.4** | 0 |
| 6.2 | 1.69 |
| + 1.3 | 3.47 |
| − 5.0 | 5.39 |
| −16.3 | 8.36 |
| −20.7 | 9.41 |
| −26.7m | 10.48 |

**B = $(NH_4)_2SO_4$.—** (*Continued*)

| *t*, °C | M % B |
|---|---|
| **$A_3B$** | |
| −20.7 | 9.41 |
| −13.1 | 10.10 |
| − 3.9 | 11.48 |
| + 5.3 | 12.36 |
| 17.6 | 14.33 |
| 26.7 | 16.21 |
| 42.7 | 20.67 |
| 46.9 | 23.12 |
| **48.0** | 25.00 |
| 45.8 | 27.88 |
| 39.8 | 30.41 |
| **AB** | |
| − 2.6m | 27.98 |
| + 4.8m | 28.60 |
| 16.0m | 29.62 |
| 22.0m | 30.41 |
| 26.1m | 30.87 |
| 32.9 | 31.21 |
| 39.4 | 31.63 |
| 53.5 | 32.65 |
| 79.8 | 35.06 |
| 97.4 | 37.31 |
| **M. c. t.** | |
| 109.5 | 39.13 |
| 120.8 | 40.67 |
| 126.4 | 42.47 |
| 136.8 | 45.18 |
| 142.6 | 47.60 |
| 144.9 | 48.08 |
| **146.9** | 50.00 |
| 144.1 | 51.84 |
| 141.7 | 53.08 |
| 137.2 | 54.27 |
| **$AB_2$ (?)** | |
| 147.2 | 55.05 |
| 151.7 | 55.43 |
| 176.7 | 57.18 |
| 187.7 | 57.98 |
| 210.2 | 59.78 |
| 229.2 | 61.64 |
| 232.0 | 62.38 |
| **$AB_x$** | |
| 269.2 | 63.45 |
| 281.5 | 63.98 |
| 318.0 | 67.37 |

**B = $HNO_3$** (113) (S.)

| *t*, °C | Wt. % B* |
|---|---|
| **A** | |
| **+10** | 0 |
| − 2.2 | 3.05 |
| −18.2 | 5.38 |
| **$A_5B$ (?)** | |
| −15.1 | 7.83 |
| − 0.7 | 10.20 |
| **+ 2.3** | 10.80 |
| + 1.0 | 13.76 |
| − 5.1 | 19.70 |
| −19.0 | 29.24 |
| (−40) | 39.40 |

**B = $HNO_3$.—** (*Continued*)

| *t*, °C | Wt. % B* |
|---|---|
| **$A_5B$ (?)** | |
| (−50) | 48.84 |

* From 0–0.7% $H_2O$ and 0.2–2% $HNOSO_4$ were also present.

**B = $SO_3$, $SO_2Cl_2$, $SeO_2$, $HNO_3$, $NO_2OHSO_2$, $HPO_2$, $H_3PO_3$, $H_3PO_4$, $POCl_3$, $B_2O_3$** (102, 103, 104, 105, 106, 177, 178, 179, 180) (S.)

M. P. of A = 10.44°

$k_A = 6.9$

**B = $PbSO_4$** (132) (A.)

1.23 M % B is sol. in A at room temp. but 1.27 M % is not all dissolved at B. P.

**B = $ZnSO_4$** (132) (A.)

| *t*, °C | M % B |
|---|---|
| **A** | |
| **10.4** | 0 |
| **$A_xB$** | |
| 28.4 | 0.20 |
| 40.1 | 0.32 |
| 46.4 | 0.41 |
| **B (?)** | |
| 66.4 | 0.41 |
| 78.0 | 0.45 |
| 94.8 | 0.52 |
| 128.6 | 0.67 |

**B = $HgSO_4$** (132) (A.)

| | |
|---|---|
| **A** | |
| **10.4** | 0 |
| **B (?)** | |
| 36.0 | 0.023 |
| 77.0 | 0.048 |
| 127.0 | 0.094 |

**B = $Hg_2SO_4$** (132) (A.)

| | |
|---|---|
| **A** | |
| **10.4** | 0 |
| **AB** | |
| 20.0 | 0.68 |
| 27.0 | 0.82 |
| 34.9 | 1.02 |
| 47.7 | 1.41 |
| 56.8 | 1.77 |
| 63.3 | 2.17 |

Mixtures >1.7 M % decompose on heating.

**B = $CuSO_4$** (132) (A.)

| | |
|---|---|
| **A** | |
| **10.4** | 0 |

**B = $CuSO_4$.—** (*Continued*)

| *t*, °C | M % B |
|---|---|
| **B (?)** | |
| 37.0 | 0.10 |
| 69.0 | 0.18 |
| 93.0 | 0.28 |
| * | 0 52 |

* Not soluble.

**B = $Ag_2SO_4$** (132) (A.)

| | |
|---|---|
| **A** | |
| **10.4** | 0 |
| 6.1 | 1.99 |
| 2.4 | 3.67 |
| **$A_2B$** | |
| 1.5 | 5.69 |
| 13.0 | 7.41 |
| 29.9 | 10.17 |
| 35.3 | 11.80 |

**$AB(\alpha)(\beta)$***

| *t*, °C | | M % |
|---|---|---|
| ($\alpha$) | ($\beta$) | B |
| 40.2 | | 12.38 |
| 43.1 | | 12.88 |
| 50.4 | | 13.63 |
| | 46.1 | 13.88 |
| | 51.7 | 14.64 |
| 59.3 | | 15.62 |
| | 62.3 | 16.76 |
| 65.3 | 65.3 | 17.43 |
| | 70.1 | 18.71 |
| | 78.6 | 21.00 |
| | 86.7 | 23.96 |
| | 96.0 | 28.55 |
| | 105.1 | 33.74 |
| | 112.8 | 38.56 |
| | 120.0 | 44.69 |

**B(M. c. t.)**

| *t*, °C | M % B |
|---|---|
| 138.9 | 47.17 |
| 165.3 | 47.75 |
| 187.2 | 48.44 |
| 197.3 | 48.69 |

* ($\alpha$) form is stable below 66°, ($\beta$) above 66°, with transformation at 122.5° to A + B.

**B = $FeSO_4$** (132) (A.)

| | |
|---|---|
| **A** | |
| **10.4** | 0 |
| **$A_xB$** | |
| 30.2 | 0.22 |
| 42.3 | 0.31 |
| 48.6 | 0.40 |
| 57.7 | 0 51 |
| 63.8 | 0.63 |

Mixtures > 0.5 M % decompose on heating.

**B = $Fe_2(SO_4)_3$** (132) (A.)

<0.015 M % B dissolves in A at B. P.

**B = $NiSO_4$** (132) (A.)

0.25 M % B is sol. in A at room temp. but 0.29 M % is not all dissolved at B. P.

**B = $MgSO_4$** (132) (A.)

| *t*, °C | M % B |
|---|---|
| **A** | |
| **10.4** | 0 |
| **$A_3B$** | |
| 25.7 | 0.18 |
| 44.2 | 0.32 |
| 66.0 | 0.62 |
| 72.3 | 0.77 |
| 82.8 | 1.07 |
| 91.7 | 1.37 |
| * | 1.53 |

* Not soluble at B. P.

**B = $CaSO_4$** (132) (A.)

| | |
|---|---|
| **A** | |
| **10.4** | 0 |
| 9.1 | 0.98 |
| 7.2 | 1.99 |
| 4.7 | 3.17 |
| 2.2 | 4.00 |

**$A_3B(\alpha)(\beta)$**

| *t*, °C | | M % |
|---|---|---|
| ($\alpha$)* | ($\beta$) | B |
| 3.4 | | 4.45 |
| 10.1 | | 4.70 |
| 13.5 | 19.1 | 4.84 |
| 18.4 | | 5.19 |
| 22.2 | 28.4 | 5.31 |
| 28.4 | | 5.74 |
| 31.5 | 36.9 | 5.92 |
| 39.7 | 45.4 | 6.63 |
| 45.4 | 51.3 | 7.11 |
| 49.4 | 55.1 | 7.59 |
| † | 60.3 | 8.34 |
| † | 62.2 | 8.66 |
| † | † | 9.06 |

* Unstable form.

† Not soluble. Mixtures >8 % decompose on heating.

**B = $BaSO_4$** (132) (A.)

| *t*, °C | M % B |
|---|---|
| **A** | |
| **10.4** | 0 |
| 9.1 | 0.95 |
| 6.6 | 2.12 |
| **+2.8** | 3.50 |
| −3.2 | 5.46 |
| −7.3 | 6.70 |
| **AB** | |
| +5.7 | 6.70 |
| 12.4 | 7.30 |
| 20.0 | 8.09 |
| 23.0 | 8.59 |
| | 8.62* |

* Not soluble. Mixtures >7 M % decompose on heating.

**B = $Li_2SO_4$** (133) (A.)

| *t*, °C | M % B |
|---|---|
| **A** | |
| **10. 3** | 0 |
| 8.0 | 0.81 |
| +2.0 | 2.85 |
| −3.6 | 4.63 |
| **$A_7B$** | |
| +3.0 | 6.42 |
| 6.5 | 7.63 |
| 9.7 | 8.75 |
| 12.9 | 11.24 |
| 13.1 | 12.33 |
| **13. 3** | 12.50 |
| 13.0 | 13.50 |
| **$A_2B$** | |
| 17.9 | 13.64 |
| 32.6 | 14.91 |
| 36.7 | 15.31 |
| 44.3 | 16.23 |
| 48.9 | 16.58 |
| **AB** | |
| 55.3 | 17.01 |
| 70.9 | 18.39 |
| 82.7 | 19.32 |
| 91.2 | 20.06 |
| **M. c. t.** | |
| 105.2 | 22.11 |
| 114.7 | 23.92 |
| 125.4 | 26.41 |
| 135.8 | 28.95 |
| 144.5 | 32.30 |
| 152.4 | 35.12 |
| 159.4 | 38.33 |
| 161.5 | 40.76 |
| 168.5 | 46.00 |
| **$AB_x$** | |
| 186.5 | 47.60 |
| 229.9 | 48.10 |
| 256.0 | 48.55 |
| 279.9 | 49.85 |
| 289.0 | 50.48 |
| 315.0 | 51.60 |

**B = $Na_2SO_4$** (58, 133, 191) (A.)

| | |
|---|---|
| **A** | |
| **10.4** | 0 |
| 4.3 | 1.92 |
| **$A_7B_2$** | |
| 10.8 | 3.69 |
| 21.2 | 4.79 |
| 36.8 | 7.04 |
| 45.4 | 8.91 |
| 55.0 | 12.63 |
| 57.4 | 15.11 |

**$A_2B(\alpha)(\beta)$**

| *t*, °C | | M % |
|---|---|---|
| ($\alpha$)* | ($\beta$) | B |
| 62.9 | 71.5 | 16.29 |
| 70.4 | 78.6 | 17.48 |
| 79.7 | 88.5 | 19.21 |
| 87.0 | 95.7 | 20.95 |
| 93.6 | 102.1 | 23.14 |

| *t*, °C | M % B |
|---|---|
| **AB (M. c. t.)** | |
| 112.5 | 25 36 |

**B = $Na_2SO_4$.—** (*Continued*)

| *t*, °C | M % B |
|---|---|
| **AB (M. c. t.)** | |
| 122.3 | 26.37 |
| 136.5 | 28.90 |
| 148.2 | 30 43 |
| 159.0 | 33.99 |
| 170.0 | 37.27 |
| 180.7 | 43.41 |
| 185.5 | 48.25 |
| **186.0** | 50.00 |
| 185.8 | 50.23 |
| **$AB_x$** | |
| 190.9 | 50.97 |
| 194.3 | 51.37 |
| 223.3 | 53.96 |
| 254.2 | 56.72 |
| 274.5 | 58.83 |

* Unstable form.

**B = $K_2SO_4$** (58, 133) (A.)

| | |
|---|---|
| **A** | |
| **10.4** | 0 |
| 7.2 | 1.0 |
| + 3.4 | 2.37 |
| − 3.2 | 4.23 |
| − 7.9 | 5.51 |
| **$A_3B$** | |
| − 0.8 | 6.87 |
| +15.4 | 8.34 |
| 36.5 | 10.40 |
| 59.1 | 13.53 |
| 77.1 | 17.21 |
| 83.3 | 19.03 |
| 89.2 | 21.80 |
| 91.5 | 24.05 |
| **91.6** | 25.00 |
| 89.0 | 28.27 |
| **AB (M. c. t.)** | |
| 105.4 | 29.29 |
| 122.1 | 30.93 |
| 136.7 | 32.49 |
| 162.0 | 35.97 |
| 178.3 | 39.22 |
| 200.2 | 43.31 |
| 210.0 | 46.77 |
| 215.7 | 48.62 |
| **218. 6** | 50.00 |
| 214.1 | 51.70 |
| 212.4 | 53.20 |
| **$AB_x$** | |
| 219.8 | 53.58 |
| 235.8 | 54.72 |
| 237.5 | 55.24 |
| **$AB_y$** | |
| 264.3 | 55.71 |
| 296.8 | 56.59 |
| 300.0 | 58.47 |

**NO**

**B = $NO_2$** (272) (S.)

| *t*, °C | Wt. % B |
|---|---|
| **AB** | |
| **(−103)*** | 60.53 |
| −104.5 | 61.3 |
| −108.5 | 63.6 |

## NO.—(*Cont'd*)

### B = $NO_2$.—(*Cont'd*)

| *t*, °C | Wt. % B |
|---|---|
| AB + $B_2$ | |
| −112.5E | 65.4 |
| $B_2$ | |
| − 73.0 | 71.0 |
| − 37.7 | 80.0 |
| − 31.7 | 82.9 |
| − 18.0 | 91.2 |
| − 10.0 | 99.9 |

* At *ca.* 103° and *P* = 42 atm. two liq. layers form.

## $NO_2$

### B = $N_2O_3$

(212) (S.)

M. P. of A = −10.14°

$k_A$ = 3.9

## $N_2O_3$

### B = $N_2O_4$ (27) (S.)

| *t*, °C | Wt. % A |
|---|---|
| B | |
| **− 11.5** | 0 |
| − 15.6 | 10.9 |
| − 20.5 | 20.2 |
| − 26 | 30.4 |
| − 34 | 42.9 |
| − 41.5 | 51.9 |
| − 50 | 59.7 |
| − 75 | 73.4 |
| − 92 | 80.1 |
| B + A | |
| −107E | 86.3 |
| A | |
| −100 | 97 |

## $N_2O_4$

### B = $HNO_3$

(40, 192) (S.)

| *t*, °C | Wt. % B |
|---|---|
| A | |
| **−10.2** | 0 |
| −11.8 | 3* |
| −11.8 | 52* |
| −21.4 | 60 |
| −32 | 62 |
| A + $AB_2$ | |
| −48.5U | 66 |
| $AB_2$ | |
| −58.5 | 70 |
| $AB_2$ + B | |
| −73E | 82 |
| B | |
| −70.0 | 85 |
| −58.5 | 90.6 |
| **−42.0** | 100 |

* Two liquid phases with following composition:

| *t*, °C | Wt. % B | |
|---|---|---|
| −11 | 52 | 3 |
| − 5 | | 4.20 |
| − 0.8 | 50 | |
| + 5 | | 5.20 |

### B = $HNO_3$.—(*Continued*)

| *t*, °C | Wt. % B | |
|---|---|---|
| 15 | 45 | |
| 19.5 | | 7.15 |
| 20 | 44.3 | |
| 35 | 37.5 | |
| 40 | | 10 |
| 50 | 30 | |
| 55 | | 20 |
| (56) | 22.5 | |

### B = $CCl_4$

(190) (S.)

| $t_L$, °C | $t_{gs}$, °C | Wt. % A |
|---|---|---|
| Mix. | | |
| **−23.5** | **−23.5** | 0 |
| −31.5 | −36.5 | 1.8 |
| −38.5 | −43.5 | 4 |
| −49E | −49E | 8.15* |
| −43.5 | −49 | 15 |
| −34.5 | −49 | 29.5 |
| −20.5 | −49 | 60 |
| −17 | −31 | 70 |
| −14 | −22 | 77.5 |
| −11 | −13 | 90 |
| **−10.2** | **−10.2** | 100 |

* Wt. % A = 62 % in mixed crystal at E.

## $NH_3$

### B = $NH_4NO_3$

(141) (S.)

| *t*, °C | M % B |
|---|---|
| A | |
| (−80) | 0 |
| A + $A_3B$ | |
| (−80)E | (1) |
| $A_3B$ | |
| −60 | 6.25 |
| −44.5 | 13.9 |
| $A_3B$ + B | |
| (−40)E | (30) |
| B | |
| −30.0 | 32.3 |
| −10.5 | 36.9 |
| 0 | 38.3 |
| +33.3 | 45.9 |
| 35.9 | 47.0 |
| 68.8 | 53.8 |
| 94.0 | 67.3 |
| 109.8 | 74.2 |
| **168** | 100 |

### B = $NH_4F$

(131) (S.)

B is practically insol. in liq. A.

### B = $NH_4Cl$

(131) (S.)

| *t*, °C | M % A |
|---|---|
| B | |
| 31.0 | **71.5** |
| 9.1 | 72.3 |
| B + $BA_3$ | |
| (9)E | (73) |
| $BA_3$ | |
| 10 | 74 |
| **10.7** | 75 |
| + 3.2 | 81.9 |
| −10 | 87.9 |
| −19.6 | 91.3 |

### B = $NH_4Cl$.—(*Continued*)

| *t*, °C | M % A |
|---|---|
| $BA_3$ | |
| −35.0 | 95.5 |
| −67.4 | 98.8 |
| $BA_3$ + A | |
| (−75)E | (99) |
| A | |
| **−74.8** | 100 |

### B = $NH_4Br$

(131) (S.)

| | | |
|---|---|---|
| B | | |
| 87 | | 68.6 |
| 32.6 | | 70.7 |
| 9.2 | | 71.8 |
| B + $BA_3$ | | |
| (9)E | | (72) |
| $BA_3$ | | |
| 9.7 | | 72.2 |
| 11.7 | | 73.1 |
| **13.7** | | 75.0 |
| + 0.4 | | 81.3 |
| −23.1 | | 85.9 |
| −57.4 | | 89.5 |
| $BA_3$ + A | | |
| (−77)E | | (91) |
| A | | |
| −76.7 | | 92.9 |
| −76.0 | | 95.6 |
| **−74.8** | | 100 |

### B = $NH_4Br$

(23) (S.)

*v.* Fig. 4

| *t*, °C | M % A | $P_{mm}$ |
|---|---|---|
| AB | | |
| 25 | 71.0 | 1590 |
| 20 | 71.4 | 1350 |
| 15 | 71.8 | 1132 |
| 10 | 72.2 | 942 |
| + 5m | 72.5 | 780 |
| 0m | 72.8 | 635 |
| − 5m | 73.2 | 512 |
| −10m | 73.4 | 405 |
| AB + $A_3B$ | | |
| 6.5E | 72.45 | 815 |
| $A_3B$ | | |
| 6.9 | 72.6 | |
| 7.3 | 73.0 | |
| 7.7 | 73.3 | |
| 8.0 | 73.7 | |
| 8.4 | 74.4 | |
| 8.6 | 74.7 | |
| **8.7** | 75.0 | 1140 |
| 8.5 | 75.9 | |
| 8.1 | 76.5 | |
| 7.6 | 77.2 | |
| AB + $A_3B$ | | |
| −21 | | 162 |
| −18 | | 185 |
| −15 | | 227 |
| −10 | | 313 |
| − 5 | | 427 |
| 0 | | 577 |
| + 3 | | 688 |
| 5 | | 770 |

### B = $NH_4I$

(131) (S.)

| *t*, °C | M % A |
|---|---|
| B | |
| 57 | 66.8 |
| +22.6 | 69.8 |
| − 7 | 72.4 |
| B + $BA_3$ | |
| (−12)E | (72.5) |
| $BA_3$ | |
| −11.5 | 73.2 |
| − 8.9 | 74.3 |
| **− 8.0** | 75 |
| − 9.1 | 75.9 |
| $BA_3$ + $BA_4$ | |
| −10.9E | 77.0 |
| $BA_4$ | |
| − 9.2 | 77.9 |
| **− 5.1** | 80 |
| −16.0 | 84.0 |
| −46.2 | 88.8 |
| −79.5 | 92.8 |
| $BA_4$ + A | |
| (−81)E | (93) |
| A | |
| −78.6 | 95.4 |
| **−74.8** | 100 |

### B = $NH_4CNS$

(41, 77) (S.)

| *t*, °C | Wt. % A |
|---|---|
| B | |
| **14.8** | 0 |
| 49.8 | 16.67 |
| 2.8 ↓ | 23.13 |
| 77 | 9.8 |
| +56 | 13.22 |
| −13.8 ↓ | 22.50 |
| B + BA | |
| −20E | 23.94 |
| BA | |
| −(16)m | 18.09 |
| −24.3 | 25.61 |
| −34.8 | 29.13 |
| BA + $BA_3$ | |
| −(43)E | (30) |
| $BA_3$ | |
| −38.8 | 36.38 |
| −(38) | 40.17 |
| −44 | 45.40 |
| $BA_3$ + $BA_6$ | |
| −(81)E | 56.50 |
| $BA_6$ | |
| −(76) | 57.31 |
| $BA_6$ + $B_2A_{13}$ (?) | |
| −(81)E | (58) |
| $B_2A_{13}$ (?) | |
| −79.8 | 59.26 |
| $B_2A_{13}$ (?) + $BA_7$ (?) | |
| −84.7E | 60.73 |
| $BA_7$ (?) | |
| −(84) | 61.03 |
| $BA_7$ (?) + $BA_8$ | |
| −87.2E | (63) |
| $BA_8$ | |
| −(87) | 64.16 |
| −90.8 | 66.40 |

### B = $NH_4CNS$.—(*Continued*)

| *t*, °C | Wt. % A |
|---|---|
| $BA_8$ + A | |
| −(96)E | (67) |
| A | |
| −85.7 | 71.00 |
| −81.3 | 76.18 |
| −78.7 | 83.18 |
| −77 | 90.01 |
| **−76.2** | 100 |

### B = NaOH

(206) (S.)

4 mg NaOH dissolves in 1000 g $NH_3$ at *ca.* −40°C. For qualitative data on solubility of several salts at temperatures up to the critical temperature, *v.* (82).

## $N_2H_4$

Hydrazine

For behavior towards aqueous solutions of various inorganic compounds, *v.* (269).

## $NH_4NO_3$

### B = $(NH_4)_2SO_4$

(199) (A.)

| *t*, °C | M % B |
|---|---|
| Mix (A + B) | |
| **169.4** | 0 |
| 171.5 | 0.56 |
| 173.6 | 1.28 |
| 177.7 | 2.84 |
| 180.6 | 5.12 |
| 180.8 | 7.36 |
| 180.8 | 8.90 |

### B = $Pb(NO_3)_2$

(36) (A.)

| | |
|---|---|
| A | |
| **158.0** | 0 |
| 150.5 | 4.77 |
| 144.0 | 6.82 |
| 136.5 | 9.09 |
| A + (?) | |
| 131.5E* | 10.77 |
| (?) | |
| 142.0 | 12.11 |
| 164.0 | 15.60 |
| 180.0 | 16.98 |
| 202.0 | 19.68 |
| 226.0 | 23.05 |

* E between 9-17 M % B.

### B = $TlNO_3$ (37)

*v.* Fig. 5

### B = $AgNO_3$ (276)

| *t*, °C | M % A |
|---|---|
| B(α) | |
| **167.8** | 0 |
| 142 | 10 |
| B(α) + B(β) | |
| 125 | 16.5 |
| B(β) | |
| 120 | 20 |
| B(β) + AB | |
| 101E | 30 |
| AB | |
| 108 | 40 |
| **109** | 50 |
| AB + A(β) | |
| 109 | 52 |
| A(β) | |
| 128 | 60 |
| 140 | 70 |
| A(α) + A(β) | |
| 159 | **76** |
| A(α) | |
| 160 | 80 |
| 190 | 90 |
| **209** | 100 |
| Solid state | |
| B(β) B(γ) | |
| 85 | 0–50 |
| B(γ) B(δ) | |
| 35 | 0–50 |

### B = $LiNO_3$

(198) (A.)

| *t*, °C | M % B |
|---|---|
| A | |
| 169.5 | 0 |
| 153.9 | 5.74 |
| 135.6 | 11.40 |
| 121.1 | 16.98 |
| 108.1 | 22.47 |
| A + B | |
| 97.0E | 27.87 |
| B | |
| 110.0 | 33.19 |
| 137.0 | 43.59 |
| 155.5 | 48.67 |
| 265.0 | 100.00 |

### B = NaCl*

(196) (A.)

| | |
|---|---|
| (?) | |
| **169.5** | 0 |
| 157.9 | 2.70 |
| 146.4 | 5.39 |
| 129.7 | 9.33 |
| $NH_4NO_3$ + $NH_4Cl$ | |
| 123.6E | 10.61 |
| $NH_4Cl$ | |
| 129.9 | **13.19** |
| 137.1 | 15.72 |
| NaCl | |
| 153.6 | 18.80 |
| 172.2 | 20.67 |

* Reciprocal salt mixtures.

### B = $NaNO_3$ (68) (A.)

| $t$, °C | M % B |
|---|---|
| A | |
| **196.6** | 0 |
| 156.5 | 4.77 |
| 144.2 | 9.57 |
| 132.0 | 14.40 |
| 124.3 | 17.78 |
| A + B | |
| 120.8E* | 19.73 |
| B | |
| 124.8 | 21.19 |
| 129.1 | 22.64 |
| 147.0 | 29.00 |
| 174.2 | 38.85 |

* E between 14.4–40 M % B.

### B = KCl† (200) (A.)

| | |
|---|---|
| A | |
| **169.6** | 0 |
| 162.7 | 2.50 |
| 155.9 | 4.73 |
| 146.6 | 8.52 |
| $NH_4NO_3 + KNO_3$ Mix. | |
| 138.8 | 11.18 |
| 137.0 | 13.14 |
| $NH_4Cl$ | |
| 140.0 | 13.97 |
| 152.2 | 15.00 |
| 168.0 | 16.00 |

Mixtures of 12–15 M % gives E at *ca.* 137.5°.

### B = $K_2SO_4$† (199) (A.)

| | |
|---|---|
| Mix. ($NH_4NO_3$ + $(NH_4)_2SO_4$) | |
| **169.5** | 0 |
| 171.7 | 1.70 |
| 173.4 | 1.92 |
| 175.3 | 4.59 |
| 176.2 | 5.83 |

### B = $KNO_3$ (199, 200) (A.)

| | |
|---|---|
| A | |
| **169.5** | 0 |
| 166.0 | 3.18 |
| 162.8 | 6.43 |
| 159.5 | 8.73 |
| A + Mix. (A + B) | |
| 157.2E | 11.07 |
| Mix. (A + B) | |
| 160.1 | 13.08 |
| 165.9 | 14.96 |
| 171.8 | 17.28 |

† Reciprocal salt mixtures.

### $NH_4Cl$

B = $NH_4Br$ (213) (A.)

M. c. t.

| $t_{M_1}$, °C* | $t_{M_2}$, °C* | M % B |
|---|---|---|
| Mix. | | |
| **520**† | **520**† | 0 |
| 517 | 518 | 15 |
| 514 | 515 | 25 |
| 511 | 512 | 35 |
| 518 | 521 | 50 |
| 536 | 537 | 85 |
| **542** | **542** | 100 |

* $t_{M_1}$ = beginning, $t_{M_2}$ = end, of fusion.
† In closed tubes.

### B = $NH_4NO_3$ (196, 198, 200) (A.)

| $t$, °C | M % A |
|---|---|
| B | |
| **169.5** | 0 |
| 164.9 | 2.80 |
| 161.5 | 4.42 |
| 155.2 | 8.70 |
| 150.2 | 11.65 |
| 146.0 | 14.25 |
| 143.2 | 15.60 |
| B + A | |
| 140.9E | 17.08 |
| A | |
| 146.5 | 18.27 |
| 155.6 | 19.58 |
| 170.6 | 20.0 |

Mixtures with 15.6–20 M % A give E near 141°.

### B = $SbCl_3$ (130) (A.)

M. c. t.

| | |
|---|---|
| B(α) | |
| **73.4** | 0 |
| 71.3 | 2.1 |
| 69.7 | 4.4 |
| 67.5m | 7.5 |
| 66.5m | 8.2 |
| B(β) | |
| 68.2 | 7.3 |
| 68.0 | 7.5 |
| 66.6 | 8.9 |
| 65.7 | 9.9 |
| B(γ) | |
| 64.4 | 12.5 |
| 63.1 | 14.1 |
| 59.5 | 18.1 |
| BA | |
| 70.0 | 19.8 |
| 89.2 | 22.9 |
| 104.1 | 25.5 |
| 123.1 | 31.3 |
| 134.8 | 34.7 |
| 139.7 | 36.2 |

### B = $SbCl_3$.— (*Continued*)

| $t$, °C | M % A |
|---|---|
| $B_2A_3$ | |
| 157.4 | 37.2 |
| 217.8 | 42.2 |
| 253.5 | 47.4 |
| 284.3 | 55.3 |
| 290.5 | 58.9 |
| **291.0** | 60.0 |
| 289.5 | 61.7 |
| A | |
| 289.5 | 63.5 |
| 296.8 | 64.6 |
| 318.0 | 68.7 |
| 338.0 | 72.2 |
| 392.0 | 81.3 |
| 418.0 | 85.9 |

### B = $ZnCl_2$ (101)

*v.* Fig. 6

### B = $CdCl_2$ (101)

*v.* Fig. 7

### B = $HgCl_2$ (30) (A.)

| | |
|---|---|
| B | |
| **265.0** | 0 |
| 263.8 | 0.90 |
| 263.3 | 1.25 |
| 262.9 | 1.69 |

$k_B$ = 35.0(0.06).

### B = CuCl (101)

*v.* Fig. 8

### B = $FeCl_3$ (101)

*v.* Fig. 9

### B = $AlCl_3$ (130) (A.)

M. c. t.

| | |
|---|---|
| B | |
| **190.2** | 0 |
| $B_xA$ | |
| 192.5 | 0.2* |
| 192.5 | 20.5 |
| 186.6 | 23.8 |
| 171.8 | 28.5 |
| 157.9 | 31.9 |
| BA | |
| 173.4 | 33.2 |
| 229.4 | 36.9 |
| 239.7 | 38.2 |
| 274.1 | 43.5 |
| 301.2 | 49.1 |
| **304.0** | 50.0 |
| 287.2 | 53.1 |
| 266 1 | 56.8 |
| 257.1 | 58.4 |
| A | |
| 284.3 | 61.0 |
| 357.0 | 65.0 |

* Two liquid layers from 0.2 to 20.5.

### B = LiCl (101)

*v.* Fig. 10

### B = NaCl (213) (A.)

M. c. t.

| $t$, °C | M % B |
|---|---|
| A | |
| 520 | 0 |
| A + (?) | |
| 520E | (?) |

### B = KCl (213) (A.)

M. c. t.

| $t_{M_1}$, °C* | $t_{M_2}$, °C* | M % B |
|---|---|---|
| Mix. | | |
| **520** | **520** | 0 |
| 552 | 556 | 5 |
| 561 | 570 | 10 |
| 571 | 576 | 15 |
| 576 | 590 | 20 |
| 592 | 610 | 25 |
| 602 | 643 | 30 |

* $t_{M_1}$ = beginning, $t_{M_2}$ = end, of melting.

### $NH_4Br$

B = $HgBr_2$ (98) (A.)

| $t$, °C | M % A |
|---|---|
| B | |
| **235.0** | 0 |
| 232.7 | 2.38 |
| 230.6 | 4.42 |
| 228.1 | 6.71 |

$k_B$ = 34.3(0.18).

### B = $AlBr_3$ (130) (A.)

M. c. t.

| | |
|---|---|
| B | |
| **97.1** | 0 |
| $B_xA$ | |
| 98.0 | 0.5* |
| 98.0 | 20.8 |
| 94.8m | 24.0 |
| $B_3A$ | |
| 96.6 | 22.8 |
| 97.5 | 23.8 |
| **97.8** | 25.0 |
| 92.7 | 27.3 |
| $B_2A$ | |
| 98.1 | 27.3 |
| 99.9 | 28.2 |
| 103.2 | 31.0 |
| 104.0 | 32.9 |
| **104.2** | 33.3 |
| 103.6 | 33.5 |
| BA | |
| 143.8 | 36.3 |
| 166.1 | 38.5 |
| 197.2 | 43.0 |
| 214.0 | 46.1 |
| 230.5 | 49.5 |
| **232.0** | 50.0 |
| 229.8 | 50.7 |
| 213.6 | 53.4 |
| 207.5 | 54.7 |
| A | |
| 360 | 57.1 |

* Two liquid layers from 0.5 to 20.8.

### B = KBr (214) (A.)

M. c. t.

| $t_{M_1}$, °C* | $t_{M_2}$, °C* | M % B |
|---|---|---|
| Mix. | | |
| **542** | **542** | 0 |
| 560 | 566 | 5 |
| 575 | 587 | 10 |

* $t_{M_1}$ = temp. of beginning of fusion; $t_{M_2}$ = temp. of complete fusion

### $P_2O_5$

B = PbO (15, 140) (A.)

| $t$, °C | M % B |
|---|---|
| $AB_2$ | |
| **824** | 66.7 |
| $AB_2 + A_2B_5$ | |
| 816E | 67 |
| $A_2B_5$ | |
| 920 | 70 |
| $A_2B_5 + AB_3$ | |
| **940**UE | 71.4 |
| $AB_3$ | |
| **1014** | 75 |
| $AB_3 + AB_4$ | |
| 970E | 77.5 |
| $AB_4$ | |
| **980** | 80 |
| 895 | 85 |
| $AB_4 + AB_8$ | |
| 840E | 86.5 |
| $AB_8$ | |
| **860** | 88.9 |
| $AB_8$ + B | |
| 820E | 93 |
| B | |
| **890** | 100 |

### $H_3PO_3$

B = $H_3PO_4$ (216) (S.)

| | |
|---|---|
| A | |
| **73.6** | 0 |
| 65.8 | 9.1 |
| 53.7 | 21.5 |
| 42.4 | 31.5 |
| 23.8 | 43.7 |
| +12.7 | 50.0 |
| A + B | |
| −13.0E | 61.0 |
| B | |
| −10.5 | 62.5 |
| + 1.5 | 68.8 |
| 21.0 | 81.8 |
| 30.3 | 91.5 |
| **35.0** | 100 |

### $POCl_3$

B = $Cl_2O$, ICl, $ICl_3$, $SO_3$, $SCl_2$, $S_2Cl_2$, $S_2Br_2$, $N_2O_5$, $PCl_3$, $PCl_5$, $PBr_3$, $PBr_5$, $AsF_3$, $AsCl_3$, $AsBr_3$, $SbCl_5$, $SbBr_3$, $BiCl_3$, $BiBr_3$, $CCl_4$, $SiCl_4$, $SiBr_4$, $SnCl_4$, $OsO_4$ (174, 175, 176, 181, 267) (S.)

M. P. of A = 1.25°

$k_A$ = 7.1

### $PBr_3$

B = $AlBr_3$ (117) (A.)

| $t$, °C | M % A |
|---|---|
| B(α) | |
| **93.0** | 0 |
| 91.8 | 1.41 |
| 89.5 | 4.04 |
| 88.1 | 5.57 |

$k_B$ = 22.5 (0.22)

| | |
|---|---|
| B(α) + B(β) | |
| 70.2 | (?) |
| B(α) (130) | |
| **97.1** | 0 |
| 91.3 | 7.3 |
| 84.1 | 14.4 |
| 76.6 | 22.4 |
| B (β) (130) | |
| 67.3 | 31.5 |
| 53.6 | 44.0 |
| 45.4 | 49.1 |

### $PI_3$

B = $AsI_3$ (120)

| $t$, °C | M % A | |
|---|---|---|
| $Mix_1$ | | |
| 141.5 | 0 | 0 |
| 137 | (2) | 10 |
| 132 | (4) | 20 |
| 124 | (7) | 30 |
| 117 | (9) | 40 |
| 108 | (11) | 50 |
| 98 | (13) | 60 |
| 87 | (15) | 70 |
| 74 | (17) | 80 |
| $Mix_1$ + $Mix_2$ | | |
| 73.5U | 17 | 82 |
| | 76 | 82 |
| $Mix_2$ | | |
| 68 | (82) | 90 |
| **61** | 100 | 100 |

### B = $SbI_3$ (120)

| $t$, °C | M % A |
|---|---|
| B | |
| **170** | 0 |
| 163 | 10 |
| 138 | 40 |
| 108 | 65 |
| B + A | |
| 52E | 91 |
| A | |
| 58 | 95 |
| **61** | 100 |

### $As_2O_3$

B = $SbCl_3$* (29) (A.)

| t, °C | M % A |
|---|---|
| B (? Mix.) | |
| **72.0** | 0 |
| 70.9 | 0.89 |
| 70.1 | 1.61 |
| 69.7 | 3.32 |

* Reciprocal salt mixtures.

### $As_2O_5$

B = PbO (15)

| t, °C | M % B |
|---|---|
| $AB_2$ | |
| **802** | 66.7 |
| $AB_2 + AB_3$ | |
| 792E | 67.5 |
| $AB_3$ | |
| 905 | 70 |
| **1042** | 75 |
| 937 | 80 |
| $AB_3 + AB_4$ | |
| 834U | 83 |
| $AB_4 + AB_8$ | |
| 815E | 83.5 |
| $AB_8$ | |
| 830 | 85 |
| **862** | 88.9 |
| 835 | 92.5 |
| $AB_8 + B$ | |
| 804E | 95 |
| B | |
| **890** | 100 |

B = $Na_3AsO_4$ (13)

*v.* Fig. 11

B = $K_3AsO_4$ (13)

*v.* Fig. 12

### $AsCl_3$

B = $AsBr_3$ (86, 254) (A.)

| t, °C | M % A |
|---|---|
| Mix. (?) | |
| **30.3** | 0 |
| 28.8 | 1.79 |
| 27.3 | 4.07 |
| 25.7 | 6.04 |

B = $SbCl_3$ (254) (A.)

| | |
|---|---|
| Mix. (?) | |
| **73.2** | 0 |
| 71.2 | 3.06 |
| 69.8 | 5.50 |
| 67.3 | 9.96 |

### $AsBr_3$

B = $AsI_3$ (86, 266) (A.)

| t, °C | M % B |
|---|---|
| Mix. (?) | |
| **31.0** | 0 |
| 30.2 | 1.20 |
| 29.4 | 2.41 |
| 27.3 | 5.99 |

B = $SbCl_3$* (86, 254, 266) (A.)

| t, °C | M % B |
|---|---|
| A (? Mix.) | |
| **31.0** | 0 |
| 30.3 | 2.48 |
| 29.7 | 5.08 |
| 29.4 | 6.60 |
| B (? Mix.) | |
| 67.7 | 95.35 |
| 70.3 | 97.58 |
| 71.7 | 98.75 |
| **73.2** | 100 |

B = $SbBr_3$ (206) (A.)

| t, °C | M % B | |
|---|---|---|
| | Mix. | |
| **31** | 0 | 0 |
| 36 | (20) | 10 |
| 44.5 | (36) | 20 |
| 50.5 | (50) | 30 |
| 59.0 | (61) | 40 |
| 65 | (70) | 50 |
| 70.5 | (77) | 60 |
| 75.5 | (83) | 70 |
| 81 | (89) | 80 |
| 86 | (97) | 90 |
| **90** | 100 | 100 |

B = $SbI_3$* (266) (A.)

| t, °C | M % B |
|---|---|
| A (? Mix.) | |
| **31.0** | 0 |
| 30.8 | 1.40 |
| 30.7 | 4.23 |
| 31.1 | 7.05 |

B = $SnBr_4$ (254) (A.)

| | |
|---|---|
| A | |
| **31.0** | 0 |
| 30.4 | 1.00 |
| 29.8 | 1.95 |
| 28.9 | 3.53 |

$k_A$ = 19.4 (0.12).

B = $SnI_4$* (86, 266) (A.)

| | |
|---|---|
| A (? Mix.) | |
| **31.0** | 0 |
| 29.6 | 1.08 |
| 28.3 | 2.12 |
| 26.1 | 4.18 |

B = $FeCl_3$* (266) (A.)

| | |
|---|---|
| A (? Mix.) | |
| **31.0** | 0 |
| 30.8 | 0.25 |

B = $AlBr_3$ (118)

| t, °C | M % A |
|---|---|
| B | |
| **97.4** | 0 |
| 87.4 | 10 |
| 77.6 | 20 |
| 37.9 | 70 |
| B + A | |
| 28.0E | 85 |

* Reciprocal salt mixtures.

B = $AlBr_3$.—(*Continued*)

| t, °C | M % A |
|---|---|
| A | |
| 29.4 | 90 |
| **32.0** | 100 |

### $AsI_3$

B = $SbCl_3$* (29, 254) (A.)

| t, °C | M % B |
|---|---|
| B (? Mix.) | |
| **73.2** | 0 |
| 70.3 | 1.05 |
| 66.3 | 2.66 |
| 64.5 | 3.44 |

B = $SbBr_3$* (86, 254) (A.)

| t, °C | M % B |
|---|---|
| B (? Mix.) | |
| **94.2** | 0 |
| 92.6 | 1.54 |
| 89.7 | 4.71 |
| 88.3 | 6.37 |

B = $SbI_3$ (120, 208, 259)

| t, °C | M % A | |
|---|---|---|
| | Mix. | |
| **170** | 0 | 0 |
| 160 | (8) | 10 |
| 152 | (16) | 20 |
| 146 | (24) | 30 |
| 140 | (36) | 40 |
| 137 | | 50 |
| 136 | | 60 |
| 135 | | 70 |
| 136 | | 80 |
| 138 | | 90 |
| **140.7** | 100 | 100 |

* Reciprocal salt mixtures.

### $As_2S_3$

B = PbS (265)

| t, °C | M % B |
|---|---|
| A | |
| **540** | 0 |
| 495 | 10 |
| 440 | 20 |
| A + Mix. | |
| 422E | 50 \| 23 |
| Mix. | |
| 490 | 54 \| 30 |
| 545 | 60 \| 40 |
| 570 | 63 \| 50 |
| 580 | 64 \| 60 |
| $AB_2 + B$ | |
| 580U | 65 |
| B | |
| 745 | 70 |
| 925 | 80 |
| 1030 | 90 |
| **1109** | 100 |

B = $Tl_2S$ (59)

| t, °C | M % A |
|---|---|
| B | |
| **448.5** | 0 |
| 401 | 10 |
| 335 | 20 |
| B + $BA_3$ | |
| 295U | 25 |

B = $Tl_2S$.—(*Cont'd*)

| t, °C | M % A |
|---|---|
| $BA_3 + BA_2$ (?) | |
| (?) | (?) |
| $BA_2$ | |
| **278** | 33.4 |
| $BA_2 + B_2A_3$ | |
| 200E | 36 |
| $B_2A_3$ | |
| **317** | 40 |
| $B_2A_3$ + BA | |
| 215E | 46 |
| BA | |
| **300** | 50 |
| 269 | 52 |

B = $Ag_2S$ (123)

| | |
|---|---|
| B(α) | |
| **842** | 0 |
| 610 | 10 |
| B(α) + $B_3A$ | |
| 469E | 17 |
| $B_3A$ | |
| 480 | 20 |
| **490** | 25 |
| 475 | 30 |
| $B_3A$ + BA | |
| 399E | 40 |
| BA | |
| **417** | 50 |
| 413 | 60 |
| 408 | 70 |
| 403 | 80 |
| Solid state | |
| B(α) + B(β) | |
| 179 | 0–25 |

### $As_2Se_3$

B = $Ag_2Se$ (195) (A.)

| | |
|---|---|
| B | |
| **880** | 0 |
| B + $A_4B_3$ | |
| 365E | 33.3 |
| $A_4B_3$ | |
| (?) | 57.1 |

### $Sb_2O_3$

B = $Sb_2S_3$ (208)

| t, °C | M % B |
|---|---|
| A | |
| **656** | 0 |
| 620 | 10 |
| 595 | 20 |
| 580 | 30 |
| 555 | 40 |
| 530 | 50 |
| A + $AB_5$ | |
| 488E | 66.5 |
| $AB_5$ | |
| 513 | 75 |
| $AB_5$ + B | |
| 522U | 80 |
| B | |
| 543 | 90 |
| **548** | 100 |

### $SbF_5$

B = $SbCl_5$ (218)

*v.* Fig. 13

### $SbCl_3$

B = $SbCl_5$ (21, 163) (A.)

| t, °C | M % A |
|---|---|
| B | |
| **2.8** | 0 |
| 1.7 | 2.17 |
| 1.4 | 2.80 |
| 1.1 | 3.35 |
| 1.0 | 3.57 |
| A | |
| 11.5 | 5.54 |
| 13.5 | 5.55 |
| B | |
| **4.0** | 0 |
| 2.5 | 4.0 |
| A | |
| 24.0 | 10.4 |
| 39.0 | 17.4 |
| 48.5 | 27.5 |
| 54.0 | 39.8 |
| 59.0 | 55.3 |
| 62.5 | 71.7 |
| 65.0 | 80.1 |
| 70.0 | 93.5 |
| **73.0** | 100 |

B = $SbBr_3$ (34)

| t, °C | $Mix_1$ M % A | $Mix_2$ M % A |
|---|---|---|
| **93** | 0 | 0 |
| 75 | 6 | 10 |
| 63 | 13 | 20 |
| $Mix_1 + Mix_2$ | | |
| 54E | 30 | 30 |
| $Mix_2$ | | |
| 56 | 58 | 40 |
| 57 | 67 | 50 |
| 59.5 | 78 | 60 |
| 62 | 85 | 70 |
| 65 | 91 | 80 |
| 69 | 96 | 90 |
| **73** | 100 | 100 |

B = $SbI_3$ (34)

| t, °C | M % A |
|---|---|
| B | |
| **165** | 0 |
| 145 | 10 |
| 130 | 20 |
| 116 | 30 |
| 103 | 40 |
| 90 | 50 |
| 77 | 60 |
| 62 | 70 |
| B + A | |
| 41E | 82 |
| A | |
| 50 | 90 |
| **73** | 100 |

### $BiCl_3$

B = $BiCl_3$ (254) (A.)

| t, °C | M % B |
|---|---|
| Mix. | |
| **73.2** | 0 |
| 74.7 | 0.81 |
| 75.4 | 1.18 |
| 77.7 | 2.00 |

B = $SnCl_2$ (130) (A.)

M. c. t.

| t, °C | M % B |
|---|---|
| A | |
| **73.4** | 0 |
| $A_xB$ | |
| 74.9 | 0.10 |
| 169.0 | 0.71 |
| 174.9 | 0.85 |
| 243.1 | 1.4* |
| 243.1 | 91.2 |
| 242.1 | 91.7 |
| 240.7 | 92.7 |
| B | |
| 241.3 | 94.7 |
| 244.5 | 97.9 |
| **246.8** | 100 |

* Two liq. layers from 1.4 to 91.2.

B = $SnCl_4$ (130, 254) (A.)

M. c. t.

| t, °C | M % B |
|---|---|
| A | |
| **73.4** | 0 |
| 70.9 | 4.6 |
| 69.4 | 6.2 |
| 67.7 | 13.5 |
| 67.0 | 17.8 |
| 66.8 | 19.1 |
| 66.5 | 23.9 |
| 66.3 | 35.8* |
| +66.3 | 73.5 |
| −30.5 | 99.7 |
| B | |
| −30.5 | 99.7 |
| **−30.2** | 100 |

* Two liq. layers from 35.8 to 73.5.

B = $SnBr_4$† (254) (A.)

| t, °C | M % A |
|---|---|
| B (? Mix.) | |
| **29.9** | 0 |
| 27.5 | 1.65 |
| 25.6 | 3.25 |

B = $SnI_4$† (29) (A.)

| t, °C | M % B |
|---|---|
| A (? Mix.) | |
| **72.0** | 0 |
| 70.6 | 0.49 |
| 69.1 | 1.12 |

† Reciprocal salt mixtures.

B = $HgCl_2$ (130) (A.)

M. c. t.

| t, °C | M % B |
|---|---|
| A | |
| **73.4** | 0 |
| 72.6 | 2.0 |
| 71.9 | 3.3 |
| B | |
| 85.4 | 5.2 |
| 101.7 | 6.5 |
| 126.3 | 9.8 |
| 142.1 | 13.1 |
| 183.5 | 25.4 |

B = $HgCl_2$.—(*Continued*)

| *t*, °C | M % B |
|---|---|
| B | |
| 218.8 | 44.3 |
| 234.5 | 58.4 |
| 246.4 | 69.6 |
| 257.1 | 79.6 |
| 264.2 | 86.1 |

B = $HgBr_2$ (130) (A.)

0.42 M % B is sol. in A at 74°; 0.61 M % at 235°; < 2.0 M % at 300°.

B = CuCl (130) (A.)

< 0.3 M % B dissolves in A at 300°.

B = AgCl (130) (A.)

< 0.2 M % B sol. in A at 300°.

B = $AlCl_3$ (130) (A.)

M. c. t.

| *t*, °C | M % A |
|---|---|
| B | |
| **190.2** | 0 |
| 190.0 | 3.6 |
| 188.6 | 17.1 |
| 181.6 | 32.2 |
| 173.6 | 41.4 |
| 160.7 | 52.2 |
| 147.6 | 59.5 |
| 137.3 | 64.2 |
| 106.1 | 77.0 |
| 83.0 | 84.8 |
| A | |
| 69.9 | 92.5 |
| 71.1 | 95.9 |
| **73.4** | 100 |

B = $BaCl_2$ (130) (A.)

< 0.4 M % B sol. in A at 300°.

B = LiCl (130) (A.)

< 0.6 M % B is sol. in A at 300°.

B = NaCl (130) (A.)

B is practically insol. in A up to 300°C.

B = KCl (130) (A.)

M. c. t.

| *t*, °C | M % B |
|---|---|
| A($\alpha$) | |
| **73.4** | 0 |
| 72.4 | 0.74 |
| 71.8 | 1.6 |
| 69.8 | 4.4 |
| 68.9 | 5.5 |
| 68.3 | 6.4 |
| A($\beta$) | |
| 67.4 | 8.7 |
| 64.6 | 11.8 |

B = KCl.—(*Cont'd*)

| *t*, °C | M % B |
|---|---|
| A($\beta$) | |
| 62.0 | 15.0 |
| 59.2 | 18.0 |
| A($\gamma$) | |
| 60.3 | 19.0 |
| 58.0 | 22.2 |
| 57.0 | 23.8 |
| AB | |
| 69.8 | 28.0 |
| 79.7 | 29.5 |
| 94.8 | 32.6 |
| 109.4 | 36.2 |
| 113.3 | 37.9 |
| $A_2B_3$ (?) | |
| 118.3 | 39.2 |
| 162.5 | 41.0 |
| 250.5 | 46.8 |
| 277.1 | 48.8 |
| 320.0 | 54.7 |
| B | |
| 360.0 | 58.5 |
| 433.5 | 61.7 |
| 533.0 | 68.7 |

B = KBr* (253) (A.)

| A (? Mix.) | |
|---|---|
| **73.2** | 0 |
| 71.8 | 1.12 |
| 71.0 | 1.68 |
| 69.9 | 2.95 |

## $SbCl_5$

B = ICl, $ICl_3$, $SbCl_3$, $SbI_3$, $CCl_4$, $InCl_4$, $SnCl_4$, $SnBr_4$, $SnI_4$, $CrO_3$, $Cr(OCl)_2$ (30, 163) (S.)

M. P. of A = 2.9°

$k_A$ = 18.5

B = $SnCl_4$ (163) (A.)

| *t*, °C | M % B |
|---|---|
| A | |
| **2.8** | 0 |
| 1.8 | 1.56 |
| 1.4 | 2.15 |
| 1.0 | 2.90 |

$k_A$ = 18.2 (0.1).

B = $SnBr_4$* (163) (A.)

| A (? Mix.) | |
|---|---|
| **2.9** | 0 |
| +1.4 | 0.51 |
| −0.4 | 1.10 |

B = $SnI_4$* (163) (A.)

| A (? Mix.) | |
|---|---|
| **2.8** | 0 |
| 1.6 | 0.24 |
| 0.0 | 0.59 |

* Reciprocal salt mixtures.

B = $AuCl_3$ (163) (A.)

| *t*, °C | M % B |
|---|---|
| A | |
| **2.8** | 0 |
| 2.5 | 0.35 |
| 2* | 0.70 |

* Not dissolved at 2°.

## $SbBr_3$

B = $SbI_3$ (34)

| *t*, °C | M % A | |
|---|---|---|
| Mix$_1$ | | |
| **165** | 0 | 0 |
| 157 | 7 | 10 |
| 148 | 15 | 20 |
| 138 | 24 | 30 |
| 127 | 33 | 40 |
| 117 | 41 | 50 |
| 105 | 50 | 60 |
| 96 | 59 | 70 |
| 88 | 71 | 80 |
| Mix$_1$ + Mix$_2$ | | |
| 84E | 85 | 85 |
| Mix$_2$ | | |
| 86 | 96 | 90 |
| **93** | 100 | 100 |

B = $BiBr_3$ (254) (A.)

| *t*, °C | M % B |
|---|---|
| Mix. | |
| **94.2** | 0 |
| 93.6 | 0.78 |
| 93.1 | 1.37 |
| 92.6 | 2.00 |

B = $SnBr_4$ (254) (A.)

| A | |
|---|---|
| **94.2** | 0 |
| 93.5 | 1.15 |
| 91.9 | 3.75 |
| 90.7 | 5.76 |
| B | |
| 28.0 | 94.13 |
| 28.0 | 95.31 |
| 28.1 | 96.75 |
| 28.9 | 98.56 |
| **29.9** | 100 |

B = $HgBr_2$ (98) (A.)

| *t*, °C | M % A |
|---|---|
| B | |
| **235.0** | 0 |
| 233.8 | 1.23 |
| 232.0 | 3.07 |
| 230.2 | 4.88 |
| 229.0 | 6.13 |

$k_B$ = 33.6 (0.18).

B = $AlBr_3$ (118)

| B | |
|---|---|
| **97.4** | 0 |
| 93.2 | 9.9 |
| 84.4 | 24.5 |
| B + BA | |
| (72)E | (32) |

B = $AlBr_3$.—(*Continued*)

| *t*, °C | M % A |
|---|---|
| BA | |
| 76.6 | 37.6 |
| **(82.5)** | 50 |
| 79.8 | 58.0 |
| 74.6 | 64.8 |
| BA + A | |
| (70)E | (71) |
| A | |
| 75.8 | 77.0 |
| 90.5 | 91.6 |
| **95.5** | 100 |

## $Sb_2S_3$

B = BiS (249)

| *t*, °C | M % B | |
|---|---|---|
| Mix. | | |
| **494** | 0 | 0 |
| 505 | 36 | 10 |
| 520 | 48 | 20 |
| 534 | 57 | 30 |
| 546 | 63 | 40 |
| 560 | 69 | 50 |
| 576 | 75 | 60 |
| 595 | 81 | 70 |
| 622 | 87 | 80 |
| 660 | 95 | 90 |
| **680** | 100 | 100 |

B = SnS (188)

| *t*, °C | M % B |
|---|---|
| A | |
| **545** | 0 |
| 522 | 10 |
| 500 | 20 |
| 477 | 30 |
| A + AB | |
| 460E | 36 |
| AB + B | |
| 480U | 41.5 |
| B | |
| 593 | 60 |
| 650 | 70 |
| 715 | 80 |
| 795 | 90 |
| **850** | 100 |

B = PbS (116, 123)

| A | |
|---|---|
| **516** | 0 |
| 480 | 10 |
| A + AB($\alpha$) | |
| 428E | 18 |
| AB($\alpha$) | |
| 468 | 25 |
| 522 | 35 |
| AB($\alpha$) + $A_2B_3$ | |
| 548U | 40 |
| $A_2B_3$ + $AB_2$ | |
| 610U | 51 |
| $AB_2$ | |
| 661 | 60 |
| **671** | 66.7 |
| 636 | 75 |
| $AB_2$ + $A_2B_5$($\alpha$) | |
| 592U | 79 |
| $A_2B_5$($\alpha$) + B | |
| 560E | 84 |

B = PbS.—(*Cont'd*)

| *t*, °C | M % B |
|---|---|
| B | |
| 640 | 90 |
| 760 | 95 |
| **1051** | 100 |
| Solid state | |
| AB($\alpha$) + AB($\beta$) | |
| 517 | 50–66.7 |
| $A_2B_5$($\alpha$) + $A_2B_5$($\beta$) | |
| 470 | 66.7–(100) |

$k_A$ = 78.9 (0) (85) (A.).

B = HgS (194) (A.)

| A | |
|---|---|
| **555.0** | 0 |
| 540 | 6.97 |
| 525 | 13.06 |
| 505 | 22.15 |
| 487 | 30.48 |

$k_A$ = 78.8 (0).

B = CuS (194) (A.)

| A | |
|---|---|
| **555** | 0 |
| 540 | 6.10 |
| 532 | 9.17 |
| 521 | 13.18 |
| 503 | 19.23 |

$k_A$ = 79.7 (0).

B = $Cu_2S$ (186)

| *t*, °C | M % A |
|---|---|
| B | |
| **1115** | 0 |
| 990 | 5 |
| 810 | 15 |
| B + $B_3A$ | |
| 610E | 24 |
| $B_3A$ | |
| **610** | 25 |
| 590 | 35 |
| 548 | 50 |
| $B_3A$ + BA | |
| 542U | 59 |
| BA | |
| 515 | 70 |
| BA + A | |
| 490E | 76.5 |
| A | |
| 525 | 90 |
| **545** | 100 |

B = $Ag_2S$ (123, 136)

| *t*, °C | M % B |
|---|---|
| A | |
| **546** | 0 |
| 515 | 10 |
| 483 | 20 |
| A + AB | |
| 449E | 28.5 |
| AB | |
| 459 | 30 |
| 497 | 40 |
| **509** | 50 |
| 482 | 60 |

B = $Ag_2S$.—(*Continued*)

| *t*, °C | M % B |
|---|---|
| AB + $AB_3$ | |
| 455E | 64.5 |
| $AB_3$ | |
| 475 | 70 |
| **483** | 75 |
| 470 | 80 |
| $AB_3$ + B | |
| 463E | 81 |
| B | |
| 600 | 90 |
| **842** | 100 |

$k_A$ = 79.4 (0.00) (85) (A.)

$k_B$ = 810.8 (0.00) (105) (A.)

## SbSe

B = $Ag_2Se$ (195) (A.)

| *t*, °C | M % A |
|---|---|
| B | |
| **880** | 0 |
| B + $A_2B$ | |
| 492E | 46 |
| $A_2B$ | |
| **553** | 66.6 |
| $A_2B$ + A | |
| 492E | 94.1 |

## $Sb_2Se_3$

B = $Ag_2Se$ (195) (A.)

| B | |
|---|---|
| **880** | 0 |
| B + $A_4B_3$ | |
| 540E | 20 |
| $A_4B_3$ | |
| **650** | 57.1 |
| $A_4B_3$ + A | |
| 573E | (?) |
| A | |
| **615** | 100 |

## $Sb_3Se_4$

B = $Ag_2Se$ (195) (A.)

| B | |
|---|---|
| **880** | 0 |
| B + AB | |
| 515E | 13.3 |
| AB | |
| (?) | 50.0 |
| AB + A | |
| 525E | 80.0 |

## $Bi_2O_3$

B = PbO (32)

| B | |
|---|---|
| **870** | 0 |
| 775 | 10 |
| 680 | 20 |
| B + $B_2A$ | |
| 580E | 28 |
| $B_2A$ | |
| 605 | 30 |
| **625** | 33.3 |

### $Bi_2O_3$.— (*Continued*)

B = PbO.— (*Continued*)

| *t*, °C | M % A |
|---|---|
| $B_2A + B_2A_3$ | |
| 609E | 36.5 |
| $B_2A_3$ | |
| 625 | 40 |
| 660 | 50 |
| **686** | 60 |
| $B_2A_3 + BA_4$ | |
| 680E | 64 |
| $BA_4 + A$ | |
| 690U | 66.5 |
| A | |
| 705 | 70 |
| 745 | 80 |
| 785 | 90 |
| **817** | 100 |

### $BiCl_3$

B = $PbCl_2$ (110)

| B | |
|---|---|
| **501** | 0 |
| 475 | 10 |
| 450 | 20 |
| 420 | 30 |
| 390 | 40 |
| 365 | 50 |
| 340 | 60 |
| $B + A_xB_y$ | |
| 325U | 67 |
| $A_xB_y$ | |
| 315 | 70 |
| 275 | 80 |
| $A_xB_y + A$ | |
| 215E | 89 |
| A | |
| 218 | 90 |
| **224** | 100 |

B = TlCl (233)

| B | | |
|---|---|---|
| **429** | 0 | |
| 380 | 10 | |
| $B + B_3A$ | | |
| 360E | 12.5 | |
| $B_3A$ | | |
| 395 | 20 | |
| **413** | 25 | |
| 403 | 30 | |
| 342 | 40 | |
| $B_3A + B_2A$ | | |
| 330U | 41 | |
| $B_2A$ | | |
| 250 | 50 | |
| $B_2A + B_3A_2$ | | |
| 225U | 52 | |
| $B_3A_2$ | | |
| 175 | 60 | |
| $B_3A_2$ + Mix. | | |
| 150E | 67.5 | |
| Mix. | | |
| 157 | 77 | 70 |
| 180 | 89 | 80 |
| 203 | 96 | 90 |
| **224** | 100 | 100 |

B = $ZnCl_2$ (110) *v.* Fig. 14

B = CuCl (110)

| *t*, °C | M % A |
|---|---|
| B | |
| **424** | 0 |
| 395 | 10 |
| 360 | 20 |
| 325 | 30 |
| 288 | 40 |
| 250 | 50 |
| 210 | 60 |
| B + A | |
| 190E | 64.5 |
| A | |
| 197 | 70 |
| 205 | 80 |
| 215 | 90 |
| **224** | 100 |

B = $FeCl_3$ (110)

| *t*, °C | M % B |
|---|---|
| A | |
| **224** | 0 |
| 210 | 10 |
| 193 | 20 |
| 175 | 30 |
| A + B | |
| 171E | 32 |
| B | |
| 195 | 40 |
| 218 | 50 |
| 233 | 60 |
| 243 | 70 |
| 253 | 80 |
| 271 | 90 |
| **298** | 100 |

### $BiBr_3$

B = $PbBr_2$ (110)

| *t*, °C | M % A |
|---|---|
| B | |
| **380** | 0 |
| 368 | 10 |
| 340 | 20 |
| 307 | 30 |
| 282 | 40 |
| 257 | 50 |
| $B + A_xB_y$ | |
| 240U | 57 |
| $A_xB_y + A$ | |
| 206E | 75 |
| A | |
| 208 | 80 |
| 214 | 90 |
| **219** | 100 |

B = $AlBr_3$ (118)

| B | |
|---|---|
| **97.4** | 0 |
| B + BA | |
| 93.5E | 16.3 |
| BA | |
| 121.8 | 28.9 |
| 142.2 | 40.2 |
| **(149)** | 50 |
| 134.9 | 59.8 |

B = $AlBr_3$.— (*Continued*)

| *t*, °C | M % A |
|---|---|
| BA + A | |
| (125)E | (65) |
| A | |
| 133.8 | 68.2 |
| 182.4 | 82.3 |
| **218.8** | 100 |

### $Bi_2S_3$

B = $Bi_2Te_3$ (14)

| B | |
|---|---|
| **575** | 0 |
| B + BA | |
| 570E | 3 |
| BA | |
| 584 | 10 |
| 598 | 20 |
| 607 | 30 |
| 612 | 40 |
| BA + A | |
| **615UE** | 50 |
| A | |
| 643 | 60 |
| 670 | 70 |
| 699 | 80 |
| 815 | 85 |

B = $Ag_2Se$ (195) (A.)

| B | |
|---|---|
| **880** | 0 |
| B + $A_4B_3$ | |
| 670E | 12.5–14.2 |
| $A_4B_3$ | |
| **773** | 57.1 |
| $A_4B_3$ + A | |
| 692E | (?) |
| A | |
| **718** | 100 |

### $Bi_2(MoO_4)_3$

B = $PbMoO_4$ (275)

| *t*, °C | M % B |
|---|---|
| A | |
| **643** | 0 |
| 638 | 10 |
| 628 | 20 |
| A + B | |
| 615E | 27.5 |
| B | |
| 633 | 30 |
| 725 | 40 |
| 810 | 50 |
| 870 | 60 |
| 925 | 70 |
| 975 | 80 |
| 1020 | 90 |
| **1065** | 100 |

### $Bi_2(WO_4)_3$

B = $PbWO_4$ (275)

| A | |
|---|---|
| **832** | 0 |
| 828 | 10 |
| 820 | 20 |
| A + B | |
| 814E | 26.5 |

B = $PbWO_4$.— (*Continued*)

| *t*, °C | M % B |
|---|---|
| B | |
| 820 | 30 |
| 844 | 40 |
| 876 | 50 |
| 916 | 60 |
| 965 | 70 |
| 1020 | 80 |
| 1076 | 90 |
| **1130** | 100 |

### $CBr_4$

B = $AlBr_3$ (118)

| *t*, °C | M % A |
|---|---|
| B | |
| **97.4** | 0 |
| 84.9 | 10.7 |
| 66.1 | 25.8 |
| 54.0 | 35.9 |
| B + A | |
| (40)E | 52 |
| A | |
| 43.7 | 59.9 |
| 57.1 | 73.1 |
| 71.9 | 84.8 |
| **92.0** | 100 |

### $CS_2$

B = $P_4S_3$(?) (247) (S.)

| *t*, °C | *x** |
|---|---|
| −20 | 9 |
| 0 | 3.7 |
| +17 | 1 |

B = $P_4S_7$ (247) (S.)

| | |
|---|---|
| 0 | 20 000 |
| 17 | 3 500 |

B = $P_4S_{10}$ (247) (S.)

| | |
|---|---|
| −20 | 1 200 |
| 0 | 550 |
| +17 | 450 |

*$x$ = parts $CS_2$ to dissolve 1 part solute.

B = $HgCl_2$ (18) (S.)

| *t*, °C | Wt. %* |
|---|---|
| −10.25 | 0.016 |
| 0 | 0.019 |
| + 8 | 0.029 |
| 13.50 | 0.023(?) |
| 19.50 | 0.045 |
| 25 | 0.055 |
| 29 | 0.062 |

B = $HgBr_2$ (18) (S.)

| | |
|---|---|
| −10.25 | 0.049 |
| 0 | 0.087 |
| + 8 | 0.122 |
| 13.50 | 0.137 |
| 19.50 | 0.182 |
| 25 | 0.230 |
| 29 | 0.268 |

* Wt. % in solution.

B = $HgI_2$ (18) (S.)

| *t*, °C | Wt. %* |
|---|---|
| −116 | 0.017 |
| − 93 | 0.023 |
| − 86.5 | 0.024 |
| − 76.5 | 0.035 |
| − 21 | 0.099 |
| − 10.25 | 0.103 |
| − 1.50 | 0.161 |
| 0 | 0.173 |
| + 8 | 0.238 |
| 13.50 | 0.269 |
| 19.50 | 0.315 |
| 25 | 0.387 |
| 29 | 0.435 |

B = $SnI_4$ (18) (S.)

| | |
|---|---|
| −114.5 | 9.41 |
| − 86 | 9.68 |
| − 84 | 10.22 |
| − 58 | 16.27 |

* Wt. % in solution.

### HCN

B = KI (147) (A.)

| *t*, °C | M % B |
|---|---|
| A | |
| **−13.3** | 0 |
| −13.5 | 0.93 |
| −14.2 | 5.46 |
| −14.3 | 6.69 |

B = $KNO_3$ (147) (A.)

| A | |
|---|---|
| **−13.3** | 0 |
| −13.5 | 1.33 |
| −13.7 | 2.14 |

### $NH_4CNS$

B = $(NH_2)_2CS$ Thiourea (264)

| A | |
|---|---|
| **146** | 0 |
| 138 | 10 |
| 122 | 20 |
| A + B | |
| 100E | 30 |
| B | |
| 112 | 40 |
| 120 | 50 |
| 126 | 60 |
| 132 | 70 |
| 136 | 80 |
| 140 | 90 |
| **142** | 100 |
| Solid state | |
| A($\alpha$) + A($\beta$) | |
| 120 | 0 |
| 112 | 10 |
| A($\beta$) + A($\gamma$) | |
| 90 | 0–70 |

B = KCNS (264) *v.* Fig. 15

For other systems in which one component is a C-compound, *v.* p. 185.

### $SiS_2$

B = PbS (57)

| *t*, °C | M % A |
|---|---|
| B | |
| **1114** | 0 |
| 900 | 20 |
| 835 | 30 |
| 805 | 35 |
| B + $B_2A$ | |
| 765U | 39 |
| $B_2A + B_3A_2$ | |
| 737U | 42 |
| $B_3A_2$ | |
| 702 | 44 |
| Solid state | |
| $B_2A$ forms at 748° | |

B = $Ag_2S$ (57)

| B | |
|---|---|
| **835** | 0 |
| B + $B_4A$ | |
| 799E | 2 |
| $B_4A$ | |
| 917 | 10 |
| **959** | 20 |
| 875 | 30 |
| $B_4A + B_3A_2$ | |
| 747E | 35.5 |
| $B_3A_2$ | |
| **756** | 40 |
| 728 | 45 |
| $B_3A_2$ + A | |
| 678E | 47.5 |
| A | |
| 730 | 55 |

### $SiC_{24}H_{20}$ Si tetraphenyl

B = $SnC_{24}H_{20}$ (189) Sn tetraphenyl

| *t*, °C | Wt. % B |
|---|---|
| Mix. | |
| **233.0** | 0 |
| 221.0* | 67.0 |
| **225.7** | 100 |

B = $PbC_{24}H_{20}$ (189) Pb tetraphenyl

| Mix. | |
|---|---|
| **233.0** | 0 |
| 218.8* | 66.0 |
| **227.7** | 100 |

* Min. $t_L$.

## $TiBr_4$

B = $SnBr_4$ (72) (A.)

| t, °C | M % A |
|---|---|
| Mix. | |
| **29.1** | 0 |
| 29.4 | 3.38 |
| 29.5 | 4.72 |
| 29.9 | 6.85 |

## $ZrBr_4$

B = $SnBr_4$ (72) (A.)

| | |
|---|---|
| Mix. | |
| **29.1** | 0 |
| 29.4 | 1.18 |
| 29.4 | 2.70 |

## $SnCl_2$

B = $PbCl_2$ (110, 229)

| t, °C | M % A | |
|---|---|---|
| Mix. | | |
| **501** | 0 | 0 |
| 470 | 7 | 15 |
| 445 | 13 | 30 |
| 425 | 19 | 40 |
| 400 | 25 | 50 |
| 380 | 32 | 60 |
| 350 | 40 | 70 |
| 315 | 54 | 80 |
| 285 | 66 | 90 |
| 247 | 100 | 100 |

B = TlCl (137)

| t, °C | M % A |
|---|---|
| B | |
| **435** | 0 |
| 388 | 10 |
| B + $B_3A$ | |
| 299E | 20 |
| $B_3A$ | |
| **310** | 25 |
| 293 | 35 |
| $B_3A$ + BA | |
| 234E | 42 |
| BA | |
| **244** | 50 |
| 232 | 60 |
| BA + A | |
| 178E | 72.5 |
| A | |
| 206 | 80 |
| 228 | 90 |
| **241** | 100 |

B = $ZnCl_2$ (110)

| | |
|---|---|
| B | |
| **261** | 0 |
| 259 | 10 |
| 238 | 30 |
| 220 | 40 |
| B + A | |
| 180E | 58 |
| A | |
| 195 | 65 |
| 220 | 80 |
| **247** | 100 |

B = $CdCl_2$ (110, 229)

| t, °C | M % A |
|---|---|
| B | |
| **568** | 0 |
| 550 | 10 |
| 525 | 20 |
| 500 | 30 |
| 472 | 40 |
| 440 | 50 |
| 403 | 60 |
| 360 | 70 |
| 300 | 80 |
| B + A | |
| 233E | 89.5 |
| A | |
| **250** | 100 |

B = CuCl (110)

| | |
|---|---|
| B | |
| **424** | 0 |
| 203↓ | 60 |
| B + A | |
| 172E | 68.5 |
| A | |
| 212 | 80 |
| 233 | 90 |
| **247** | 100 |

B = $MnCl_2$ (229)

| | |
|---|---|
| B | |
| **650** | 0 |
| 630 | 10 |
| 605 | 20 |
| 580 | 30 |
| 552 | 40 |
| 517 | 50 |
| 480 | 60 |
| 433 | 70 |
| 375 | 80 |
| 297 | 90 |
| B + A | |
| 230E | 95 |
| A | |
| **250** | 100 |

B = $AlCl_3$ (130) (A.) M. c. t.

| | |
|---|---|
| B | |
| **190.2** | 0 |
| $B_xA$ | |
| 191.0 | 0.98 |
| 191.3 | 1.11 |
| 192.0 | 1.5* |
| 192.0 | 14.3 |
| 191.0 | 15.3 |
| 188.2 | 18.1 |
| $B_2A$ | |
| 187.0 | 22.1 |
| 204.4 | 28.5 |
| 207.4 | 30.7 |
| **209.3** | 33.3 |
| 195.0 | 38.8 |
| 178.6 | 43.1 |
| 158.7 | 48.5 |
| 136.9m | 53.9 |
| BA | |
| **158.5** | 50.0 |
| 158.2 | 50.7 |

B = $AlCl_3$.— (*Continued*)

| t, °C | M % A |
|---|---|
| BA | |
| 153.3 | 54.6 |
| 142.3 | 63.5 |
| 135.4m | 69.8 |
| A | |
| 138.3 | 68.5 |
| 154.3 | 70.9 |
| 176.3 | 75.0 |
| 223.4 | 86.1 |
| 235.7 | 90.8 |
| **246.8** | 100 |

* Two liq. layers from 1.5 to 14.3.

B = $MgCl_2$ (159)

| | |
|---|---|
| B | |
| **711** | 0 |
| 690 | 10 |
| 660 | 25 |
| 597 | 50 |
| 530 | 70 |
| 490 | 80 |
| 380 | 95 |
| B + A | |
| 245E | >99 |
| A | |
| **245** | 100 |

B = $CaCl_2$ (159, 229)

| | |
|---|---|
| B | |
| **777** | 0 |
| (745) | 20 |
| (705) | 40 |
| 635 | 60 |
| 570 | 70 |
| 490 | 80 |
| 385 | 90 |
| B + A | |
| 245E | (100) |
| A | |
| **245** | 100 |

B = NaCl (210)

| t, °C | M % B |
|---|---|
| A | |
| **239** | 0 |
| 230 | 10 |
| 210 | 20 |
| A + B | |
| 183E | 32 |
| B | |
| 395 | 40 |
| 517 | 50 |
| 675 | 70 |
| 720 | 80 |
| **800** | 100 |

B = KCl (210)

| | |
|---|---|
| A | |
| **239** | 0 |
| 224 | 10 |
| A + $A_3B$ | |
| 201E | 16 |
| $A_3B$ | |
| 206 | 20 |
| **208** | 25 |
| 197 | 35 |

B = KCl.— (*Continued*)

| t, °C | M % B |
|---|---|
| $A_3B$ + AB | |
| 180E | 38.5 |
| AB | |
| 210 | 45 |
| AB + B | |
| **224**UE | 50 |
| B | |
| 465 | 60 |
| 580 | 70 |
| 675 | 80 |
| 740 | 90 |
| **777** | 100 |

## $SnCl_4$

B = $SnBr_4$ (85) (A.)

| t, °C | M % A |
|---|---|
| Mix. (?) | |
| **29.4** | 0 |
| 28.1 | 1.27 |
| 26.8 | 2.55 |
| 24.7 | 4.99 |

B = $AlCl_3$ (130) (A.) M. c. t.

| | |
|---|---|
| B | |
| **190.2** | 0 |
| 188.6 | 6.8 |
| 182.6 | 19.3 |
| 174.2 | 34.8 |
| 167.8 | 47.3 |
| 158.3 | 63.2 |
| 150.0 | 74.4 |
| 139.5 | 83.4 |
| 130.9 | 89.6 |
| 122.0 | 93.2 |
| 113.4 | 95.9 |
| 89.9 | 98.8 |
| +65.7 | 99.6 |
| A | |
| **−30.2** | 100 |

## $SnBr_2$

B = $AlBr_3$ (130) (A.) M. c. t.

| | |
|---|---|
| B | |
| **97.1** | 0 |
| 96.9 | 0.35 |
| 96.5 | 0.81 |
| $B_2A$ | |
| 121.6 | 0.81 |
| 137.1 | 1.07 |
| 152.8 | 1.45 |
| 161.1 | 1.8* |
| 161.1 | 14.2 |
| 162.2 | 16.4 |
| 164.3 | 18.5 |
| 178.5 | 24.7 |
| 190.2 | 28.3 |
| **205.0** | 33.3 |
| 202.0 | 34.9 |
| 181.8 | 41.5 |
| 175.4 | 43.7 |

B = $AlBr_3$.— (*Continued*)

| t, °C | M % A |
|---|---|
| BA | |
| 175.0 | 44.8 |
| 179.8 | 48.3 |
| **183.0** | 50.0 |
| 179.1 | 52.4 |
| 164.4 | 59.6 |
| 158.3 | 62.8 |
| A | |
| 175.1 | 71.2 |
| 195.9 | 78.1 |
| 220.9 | 90.8 |
| 228.2 | 96.2 |
| **232.0** | 100 |

* Two liq. layers from 1.8 to 14.2.

## $SnBr_4$

B = $SnI_4$ (211) *v.* Fig. 16

| t, °C | M % B |
|---|---|
| (?) | |
| 206 | 0 |
| 215 | 20 |
| 231 | 40 |
| 255 | 60 |
| 289 | 80 |
| 346 | 100 |
| Solid state A(α) + B(β) and A(β) + B(α) | |
| **29.2** | 0 \| 0 |
| 23 | (8) \| 10 |
| $Mix_1$ + $Mix_2$ | |
| 19.5E | 22 \| 22 |
| $Mix_2$ | |
| 26 | (32) \| 30 |
| 38 | (43) \| 40 |
| 54 | (54) \| 50 |
| 71 | (64) \| 60 |
| 90 | (74) \| 70 |
| 109 | (83) \| 80 |
| 128 | (92) \| 90 |
| **145** | 100 \| 100 |

B = $AlBr_3$ (130) (A.) M. c. t.

| t, °C | M % A |
|---|---|
| B(α) | |
| **97.1** | 0 |
| 94.3 | 2.5 |
| 85.4 | 13.4 |
| 76.4 | 22.7 |
| B(α) + B(β) | |
| 70.2 | (?) |
| B(β) | |
| 65.7 | 35.4 |
| 45.8 | 56.7 |
| 25.5 | 74.4 |
| A | |
| 22.3 | 76.0 |
| 23.4 | 82.5 |
| 27.6 | 93.3 |
| **31.0** | 100 |

## SnS

B = PbS (109)

| t, °C | Wt. % A | |
|---|---|---|
| Mix. | | |
| **1106** | 0 | 0 |
| 1005 | 6 | 20 |
| 898 | 9 | 40 |
| Mix. + A | | |
| 880E | 9 | 43 |

B = FeS (100)

| t, °C | Wt. % B |
|---|---|
| A | |
| **(870)** | 0 |
| 835 | 5 |
| A + B | |
| 785E | 15 |
| B | |
| 805 | 20 |
| 850 | 30 |
| 905 | 40 |
| 960 | 50 |
| 1020 | 60 |
| 1070 | 70 |
| 1155 | 90 |
| **(1188)** | 100 |

## $SnC_{24}H_{20}$

Sn tetraphenyl

B = $PbC_{24}H_{20}$ (189) Pb tetraphenyl

| | |
|---|---|
| Mix.* | |
| **225.7** | 0 |
| **227.7** | 100 |

* Neither max. nor min. $t_L$.

B = $HgC_{10}H_{12}$ (56) Hg tetraphenyl

| t, °C | M % B |
|---|---|
| A | |
| **223.0** | 0 |
| A + B | |
| 115.0E | 97.0 |
| B | |
| **121.8** | 100 |

## PbO

B = $PbF_2$ (228)

| t, °C | M % A |
|---|---|
| B | |
| **824** | 0 |
| 517↓ | 50 |
| B + A | |
| 492E | 54 |
| A | |
| 547↑ | 60 |
| **892**↓ | 100 |

B = $PbCl_2$ (217)

| | |
|---|---|
| B | |
| **499** | 0 |
| 475 | 10 |
| B + BA | |
| 436E | 23 |
| BA | |
| 475 | 30 |
| BA + $BA_2$ | |
| 524U | 40 |

## PbO.—(*Cont'd*)

B = $PbCl_2$.—(*Continued*)

| *t*, °C | M % A |
|---|---|
| $BA_2$ | |
| 610 | 50 |
| 675 | 60 |
| **693** | 66.7 |
| $BA_2$ + Mix. | |
| 690E | 72 \| 70 |
| Mix. | |
| 705 | 76 \| 75 |
| $BA_4$ | |
| 711 | 80 |
| $BA_4$ + A | |
| 703E | 85 |
| A | |
| 760 | 90 |
| **835** | 100 |

B = $PbBr_2$ (228)

| B | |
|---|---|
| **368** | 0 |
| 358 | 5 |
| B + BA | |
| 348E | 13 |
| BA | |
| 425 | 20 |
| 470 | 30 |
| BA + $BA_2$ | |
| 476U | 35 |
| $BA_2$ | |
| 515 | 40 |
| 630 | 50 |
| **712** | 66.7 |
| $BA_2$ + $BA_4$ | |
| 700E | 76 |
| $BA_4$ + A | |
| **742**UE | 80 |
| A | |
| 798 | 90 |
| **892** | 100 |

B = $PbSO_4$ (122, 238)

| *t*, °C | M % B |
|---|---|
| A | |
| **879** | 0 |
| A + $A_3B$ | |
| 835E | 11 |
| $A_3B$ + $A_2B$ | |
| 897U | 17.5 |
| $A_2B$ | |
| 950 | 25 |
| **961** | 33.3 |
| $A_2B$ + AB | |
| 950E | 40 |
| AB | |
| **977** | 50 |
| 972 | 60 |
| AB + B | |
| 960E | 68 |
| B($\alpha$) | |
| 1007 | 70 |
| 1092 | 80 |
| **(1170)** | 100 |
| Solid state | |
| B($\alpha$) + B($\beta$) | |
| 864 | 50–100 |

B = CuO (66) (A.)

| *t*, °C | M % B |
|---|---|
| A | |
| **875** | 0 |
| 850 | 5.06 |
| 818 | 12.29 |
| 797 | 17.96 |
| 774 | 27.11 |
| 727 | 42.58 |
| 712 | 49.60 |
| A + (?) | |
| 698E* | 59.12 |
| (?) | |
| 712 | 69.66 |

* All mixtures give a halting pt. at *ca.* 698°.

B = $Ag_2O$ (135) (A.)

At *ca.* 840°, 3–6 Wt. % Ag dissolves in molten A, forming B.

B = $PbCrO_4$ (122)

| A | |
|---|---|
| **879** | 0 |
| 850 | 5 |
| A + $A_4B$ | |
| 785E | 11 |
| $A_4B$ + $A_5B_2$ | |
| 815U | 16 |
| $A_5B_2$ | |
| 830 | 20 |
| 854 | 28.6 |
| $A_5B_2$ + AB | |
| 841E | 32 |
| AB | |
| 905 | 40 |
| **920** | 50 |
| 910 | 60 |
| AB + Mix. | |
| 820E | 99 \| 87 |
| B | |
| **844** | 100 |
| Solid state | |
| $A_5B_2(\alpha)$ + $A_5B_2(\beta)$ | |
| 744 | 29–50 |
| B($\alpha$) + B($\beta$) | |
| 785 | 50–98 |
| 783 | 100 |
| B($\beta$) + B($\gamma$) | |
| 701 | 50–98 |
| 707 | 100 |

B = $PbMoO_4$ (122)

| *t*, °C | M % A |
|---|---|
| B | |
| **879** | 0 |
| 810 | 10 |
| B + BA | |
| 762E | 12 |
| BA | |
| 878 | 20 |
| 920 | 30 |
| 940 | 40 |
| **951** | 50 |
| BA + A | |
| 933E | 60 |
| A | |
| 998 | 70 |

B = $PbMoO_4$.—(*Continued*)

| *t*, °C | M % A |
|---|---|
| A | |
| 1032 | 80 |
| 1052 | 90 |
| **1065** | 100 |

B = $PbWO_4$ (122)

| *t*, °C | M % B |
|---|---|
| A | |
| **879** | 0 |
| 810 | 10 |
| A + AB | |
| 722E | 17 |
| AB | |
| 780 | 20 |
| 855 | 30 |
| 885 | 40 |
| 899 | 50 |
| AB + B($\alpha$) | |
| 892E | 53 |
| B($\alpha$) | |
| 975 | 60 |
| 1037 | 70 |
| 1087 | 85 |
| **1123** | 100 |
| Solid state | |
| B($\alpha$) + B($\beta$) | |
| 877 | (50)–100 |

B = $V_2O_5$ (15)

| *t*, °C | M % A |
|---|---|
| B | |
| **660** | 0 |
| 653 | 10 |
| 633 | 20 |
| 602 | 30 |
| 554 | 40 |
| B + $BA_2$ | |
| 475E | 50 |
| $BA_2$ | |
| 610 | 55 |
| 677 | 60 |
| **722** | 66.7 |
| $BA_2$ + $BA_3$ | |
| 718E | 68 |
| $BA_3$ | |
| 870 | 70 |
| **952** | 75 |
| 885 | 80 |
| $BA_3$ + $BA_8$ | |
| 755E | 84 |
| $BA_8$ | |
| **794** | 88.9 |
| $BA_8$ + A | |
| 760E | 93 |
| A | |
| 817 | 95 |
| **890** | 100 |

B = $B_2O_3$ (156) (A.)

| *t*, °C | M % B |
|---|---|
| AB | |
| 250 | 36.50 |
| 450 | 41.60 |
| 500 | 51.50 |
| 485 | 52.80 |
| 420 | 59.50 |

B = $B_2O_3$.—(*Continued*)

| *t*, °C | M % B |
|---|---|
| AB + $AB_2$ | |
| 360E | 61.10 |
| $AB_2$ | |
| 450 | 62.42 |
| 550 | 65.25 |
| 570 | 65.66 |
| 520 | 67.84 |
| 475 | 68.20 |
| $AB_2$ + $A_2B_5$ | |
| 460E | 69.70 |
| $A_2B_5$ | |
| 475 | 69.55 |
| 520 | 71.10 |
| $A_2B_5$ + $AB_3$ | |
| 490E | 72.83 |
| $AB_3$ | |
| 530 | 74.46 |
| 560 | 76.10 |
| 480 | 78.10 |

## $PbF_2$

B = $PbCl_2$ (224)

| *t*, °C | M % A |
|---|---|
| $Mix_1$ | |
| **495** | 0 \| 0 |
| $Mix_1$ + $Mix_2$ | |
| 453E | 3 \| 10 |
| | 48 \| 10 |
| $Mix_2$ | |
| 525 | (49) \| 20 |
| 570 | (49.5) \| 30 |
| 593 | (50) \| 40 |
| BA | |
| **601** | 50 |
| $Mix_3$ | |
| 592 | (52) \| 60 |
| 570 | (56) \| 70 |
| $Mix_3$ + $BA_4$ | |
| 554E | 58 \| 75 |
| $BA_4$ + A | |
| **570**UE | 80 |
| A | |
| 695 | 90 |
| **824** | 100 |

B = $PbBr_2$ (224)

| B | |
|---|---|
| **366** | 0 |
| B + BA | |
| 349E | 5 |
| BA | |
| 420 | 10 |
| 495 | 20 |
| 530 | 30 |
| 550 | 40 |
| **561** | 50 |
| 555 | 60 |
| 537 | 70 |
| BA + $BA_4$ | |
| 533E | 75 |
| $BA_4$ + B | |
| **585**UE | 80 |
| B | |
| 695 | 90 |
| **824** | 100 |

B = $PbI_2$ (224)

| *t*, °C | M % A |
|---|---|
| B | |
| **400** | 0 |
| B + BA | |
| 383E | 10 |
| BA + $BA_4$ | |
| 434U | 20 |
| $BA_4$ | |
| 472 | 30 |
| 499 | 40 |
| 524 | 50 |
| 548 | 60 |
| 564 | 70 |
| $BA_4$ + A | |
| 573U | 75 |
| A | |
| 607 | 80 |
| 645 | 85 |
| **825** | 100 |

B = $Pb_3(PO_4)_2$ (16)

| *t*, °C | M % B |
|---|---|
| A | |
| **820** | 0 |
| A + $AB_3$ | |
| 698E | 8 |
| $AB_3$ | |
| 847 | 20 |
| 925 | 30 |
| 1035 | 50 |
| 1083 | 65 |
| **1098** | 75 |
| 1080 | 85 |
| 1032 | 95 |
| $AB_3$ + B | |
| 1004E | 98 |
| B | |
| **1014** | 100 |

B = $Pb_3(AsO_4)_2$ (14)

| A | |
|---|---|
| **820** | 0 |
| A + $AB_3$ | |
| 675E | 8 |
| $AB_3$ | |
| 790 | 20 |
| 910 | 35 |
| 983 | 50 |
| 1015 | 60 |
| **1042** | 75 |
| 1032 | 85 |
| $AB_3$ + B | |
| 1018E | 90 |
| B | |
| **1042** | 100 |

B = $Pb_3(VO_4)_2$ (16)

| A | |
|---|---|
| **820** | 0 |
| A + $AB_3$ | |
| 803 | 30 |
| 847 | 40 |
| 880 | 50 |
| 910 | 65 |
| **916** | 75 |
| $AB_3$ + B | |
| 912E | 82 |

B = $Pb_3(VO_4)_2$.—(*Continued*)

| *t*, °C | M % B |
|---|---|
| B | |
| 928 | 90 |
| **952** | 100 |

B = NaF (205)

| *t*, °C | M % A |
|---|---|
| B | |
| **1040** | 0 |
| 990 | 10 |
| 930 | 20 |
| 872 | 30 |
| 808 | 40 |
| 735 | 50 |
| 650 | 60 |
| B + A | |
| 540E | 67.5 |
| A | |
| 630 | 75 |
| 730 | 85 |
| **855** | 100 |

$k_B$ = 18.7 (0.6) (A.)

## $PbCl_2$

B = $PbBr_2$ (162)

| *t*, °C | M % B |
|---|---|
| Mix. + liq. | |
| **495** | 0 |
| **370** ↓ | 100 |

B = $PbI_2$ (162)

| A | |
|---|---|
| **495** | 0 |
| 457 | 10 |
| 425 | 20 |
| 400 | 30 |
| 375 | 40 |
| 352 | 50 |
| 335 | 60 |
| 316 | 70 |
| A + B | |
| 306E | 76 |
| B | |
| 315 | 80 |
| **358** ↓ | 100 |

B = PbS (256)

| A | |
|---|---|
| **499** | 0 |
| 478 | 10 |
| A + B | |
| 442E | 22 |
| B | |
| 560 | 35 |
| 835 | 65 |
| 1030 | 90 |
| **1106** | 100 |

B = $Pb_3(PO_4)_2$ (16)

| A | |
|---|---|
| **494** | 0 |
| A + $AB_3$ | |
| 480E | 5 |
| $AB_3$ | |
| 700 | 10 |
| 910 | 20 |
| 1005 | 30 |
| 1065 | 40 |

B = $Pb_3(PO_4)_2$.— (*Continued*)

| *t*, °C | M % B |
|---|---|
| $AB_3$ | |
| 1110 | 50 |
| 1135 | 60 |
| **1156** | 75 |
| 1130 | 85 |
| 1050 | 95 |
| $AB_3 + B$ | |
| 994E | 98.5 |
| B | |
| **1014** | 100 |

B = $Pb_3(AsO_4)_2$ (16)

| | |
|---|---|
| A | |
| **494** | 0 |
| $A + AB_3$ | |
| 478E | 3.5 |
| $AB_3$ | |
| 843 | 20 |
| 945 | 30 |
| 1010 | 40 |
| 1070 | 50 |
| 1110 | 60 |
| **1140** | 75 |
| 1120 | 85 |
| 1078 | 95 |
| $AB_3 + B$ | |
| 1040E | 98 |
| B | |
| **1042** | 100 |

B = $Pb_3(VO_4)_2$ (16)

| | |
|---|---|
| A | |
| **494** | 0 |
| $A + AB_3$ | |
| 468E | 4 |
| $AB_3$ | |
| 620 | 10 |
| 820 | 25 |
| 915 | 40 |
| 950 | 50 |
| 975 | 60 |
| **990** | 75 |
| 970 | 85 |
| 943 | 90 |
| $AB_3 + B$ | |
| 912E | 94 |
| B | |
| **952** | 100 |

B = TlCl (137)

| *t*, °C | M % A |
|---|---|
| B | |
| **435** | 0 |
| 405 | 10 |
| $B + B_3A$ | |
| 388E | 13.5 |
| $B_3A$ | |
| **407** | 25 |
| 400 | 35 |
| $B_3A + BA_2$ | |
| 378E | 41 |
| $BA_2$ | |
| 410 | 50 |
| 430 | 60 |
| **435** | 66.7 |

B = TlCl.— (*Continued*)

| *t*, °C | M % A |
|---|---|
| $BA_2 + A$ | |
| 428E | 74 |
| A | |
| 448 | 80 |
| 480 | 90 |
| **500** | 100 |

B = $ZnCl_2$ (110)

| *t*, °C | M % B |
|---|---|
| A | |
| **501** | 0 |
| 460 | 20 |
| 420 | 35 |
| 375 | 50 |
| 348 | 60 |
| 325 | 70 |
| 307 | 80 |
| 273 | 95 |
| $A + B$ | |
| 261E | >99 |
| B | |
| **261** | 100 |

B = $CdCl_2$ (110, 229)

| | |
|---|---|
| A | |
| **501** | 0 |
| 460 | 15 |
| 400 | 30 |
| $A + B$ | |
| 385E | 39 |
| B | |
| 422 | 50 |
| 452 | 60 |
| 483 | 70 |
| 513 | 80 |
| 542 | 90 |
| **568** | 100 |

B = CuCl (110)

| | |
|---|---|
| A | |
| **501** | 0 |
| 437 | 20 |
| 358 | 40 |
| 312 | 50 |
| $A + B$ | |
| 280E | 57 |
| B | |
| 286 | 60 |
| 310 | 70 |
| 347 | 80 |
| 388 | 90 |
| **424** | 100 |

B = AgCl (255, 257)

| | |
|---|---|
| A | |
| **496** | 0 |
| 465 | 10 |
| 437 | 20 |
| 406 | 30 |
| 375 | 40 |
| 342 | 50 |
| $A + B$ | |
| 310E | 60 |

B = AgCl.— (*Continued*)

| *t*, °C | M % B |
|---|---|
| B | |
| 342 | 70 |
| 383 | 80 |
| 428 | 90 |
| **457** | 100 |

B = $MnCl_2$ (229)

| *t*, °C | M % A |
|---|---|
| B | |
| **650** | 0 |
| 630 | 10 |
| 605 | 20 |
| 575 | 30 |
| 540 | 40 |
| 500 | 50 |
| 457 | 60 |
| $B + A$ | |
| 408E | 70 |
| A | |
| 430 | 80 |
| 460 | 90 |
| **495** | 100 |

B = $FeCl_3$ (110)

| *t*, °C | M % B |
|---|---|
| A | |
| **501** | 0 |
| 470 | 20 |
| 385 | 40 |
| $A + B$ | |
| 177E | 63 |
| B | |
| 257 | 80 |
| 283 | 90 |
| **298** | 100 |

B = $BeCl_2$ (280)

B = $MgCl_2$ (159)

| *t*, °C | M % A |
|---|---|
| B | |
| **711** | 0 |
| 680 | 15 |
| 643 | 30 |
| 555 | 60 |
| $B + A$ | |
| 459E | 81 |
| A | |
| 482 | 90 |
| **496** | 100 |

B = $CaCl_2$ (159, 229)

| | |
|---|---|
| B | |
| **772** | 0 |
| 738 | 10 |
| 704 | 20 |
| 670 | 30 |
| 635 | 40 |
| 602 | 50 |
| 568 | 60 |
| 530 | 70 |
| 485 | 80 |
| $B + A$ | |
| 467E | 82 |
| A | |
| 485 | 90 |
| **495** | 100 |

B = $SrCl_2$ (229)

| *t*, °C | M % A |
|---|---|
| Mix. | |
| **872** | 0 \| 0 |
| 855 | (6) \| 10 |
| 790 | (13) \| 20 |
| 710 | (27) \| 40 |
| 665 | (35) \| 50 |
| 615 | (45) \| 60 |
| 565 | (57) \| 70 |
| 535 | (67) \| 80 |
| 515 | 76 \| 90 |
| 505 | 82 \| 95 |
| **495** | 100 \| 100 |

B = $BaCl_2$ (229)

| | |
|---|---|
| $Mix_1$ | |
| **960** | 0 \| 0 |
| 928 | (2) \| 5 |
| $Mix_1 + Mix_2$ | |
| 912* | (3) \| 8 |
| | 2 \| 8 |
| $Mix_2$ | |
| 860 | (6) \| 20 |
| 805 | (12) \| 30 |
| 750 | (20) \| 40 |
| 685 | (30) \| 50 |
| 625 | (41) \| 60 |
| 570 | (55) \| 70 |
| 535 | (67) \| 80 |
| 512 | 80 \| 90 |
| **495** | 100 \| 100 |

* $B(\alpha) \rightarrow B(\beta)$ lowered from 923° at M = 0.

B = LiCl (255)

| *t*, °C | M % B |
|---|---|
| A | |
| **496** ↓ | 0 |
| 420 | 40 |
| $A + B$ | |
| 410E | 44.5 |
| B | |
| 464 | 60 |
| 521 | 75 |
| 585 | 90 |
| **607** | 100 |

B = NaCl (255)

| | |
|---|---|
| A | |
| **496** | 0 |
| 476 | 10 |
| 445 | 20 |
| $A + B$ | |
| 410E | 28.5 |
| B | |
| 478 | 40 |
| 540 | 50 |
| 610 | 60 |
| 675 | 70 |
| 725 | 80 |
| 768 | 90 |
| **798** | 100 |

B = KCl (151, 255)

| | |
|---|---|
| A | |
| **496** | 0 |
| 475 | 10 |
| 441 | 20 |

B = KCl.— (*Continued*)

| *t*, °C | M % B |
|---|---|
| $A + A_2B$ | |
| 429E | 23 |
| $A_2B$ | |
| **440** | 33.3 |
| 433 | 40 |
| $A_2B + AB_2$ | |
| 411E | 48.5 |
| $AB_2$ | |
| 430 | 50 |
| 464 | 55 |
| $AB_2 + B$ | |
| 490U | 62 |
| B | |
| 580 | 70 |
| 667 | 80 |
| 730 | 90 |
| **775** | 100 |

B = RbCl (255)

| | |
|---|---|
| A | |
| **496** | 0 |
| 448 | 15 |
| $A + A_2B$ | |
| 410E | 23 |
| $A_2B$ | |
| **424** | 33.3 |
| $A_2B + AB$ | |
| 407E | 39 |
| AB | |
| 435 | 45 |
| **440** | 50 |
| $AB + AB_2$ | |
| 414E | 58.5 |
| $AB_2 + B$ | |
| 449U | 64.5 |
| B | |
| 510 | 70 |
| 605 | 80 |
| 680 | 90 |
| **724** | 100 |

## $PbBr_2$

B = $PbI_2$ (162)

| | |
|---|---|
| A | |
| **370** | 0 |
| 348 | 10 |
| 326 | 20 |
| 302 | 30 |
| 276 | 40 |
| $A + B$ | |
| 256E | 47 |
| B | |
| 278 ↑ | 60 |
| **358** ↓ | 100 |

B = $HgBr_2$ (229)

| *t*, °C | M % A |
|---|---|
| B | |
| **238** | 0 |
| $B + A$ | |
| 233E | 5 |
| A | |
| 252 | 10 |
| 270 | 20 |
| 279 | 30 |

B = $HgBr_2$.— (*Continued*)

| *t*, °C | M % A |
|---|---|
| A | |
| 283 | 40 |
| 288 | 50 |
| 297 | 60 |
| 309 | 70 |
| 324 | 80 |
| 344 | 90 |
| **366** | 100 |

B = AgBr (257)

| *t*, °C | M % B |
|---|---|
| B | |
| **422** | 0 |
| 395 | 10 |
| 365 | 20 |
| 330 | 30 |
| 295 | 40 |
| $B + A_2B$ | |
| 276E | 45.2 |
| $A_2B$ | |
| 282 | 50 |
| 290 | 60 |
| $A_2B + B$ | |
| 295UE | 66.7 |
| B | |
| 302 | 70 |
| 320 | 80 |
| 344 | 90 |
| **373** | 100 |

## $PbBr_2$

B = $AlBr_3$ (130) (A.)
M. c. t.

| *t*, °C | M % A |
|---|---|
| B | |
| **97.1** | 0 |
| $B_2A$ | |
| 191.9 | 0.6 |
| 210.4 | 0.8* |
| 210.4 | 16.2 |
| 211.9 | 16.9 |
| 220.4 | 20.1 |
| 235.5 | 23.7 |
| 253.5 | 27.0 |
| 272.5 | 32.5 |
| **274.0** | 33.3 |
| 266.9 | 37.0 |
| 241.6 | 43.6 |
| 234.9 | 45.5 |
| A | |
| 268.4 | 52.3 |
| 296.8 | 57.7 |

* Two liq. layers from 0.8 to 16.2.

## PbI

B = $HgI_2$ (98) (A.)

| | |
|---|---|
| B | |
| **250.0** | 0 |
| 247.4 | 3.11 |
| 241.2 | 6.04 |

$k_B = 56.5$ (0).

### $PbI_2$

B = AgI (257)

| t, °C | M % A |
|---|---|
| Mix. + liq. | |
| **552** | 0 |
| 465 | 10 |
| 395* | 20 |
| 373 | 30 |
| 357 | 40 |
| 349 | 50 |
| 344 | 60 |
| 357 | 70 |
| 372 | 80 |
| 387 | 90 |
| **402** | 100 |
| Solid state | |
| $B_4A(\alpha) + B_4A(\beta)$ | |
| 115 | 0–80 |
| $B(\alpha) + B(\beta)$ | |
| 144.6 | 0–20 |

* M. P. of $B_4A$.

### PbS

B = $Tl_2S$ (59)

| t, °C | M % B | |
|---|---|---|
| $Mix_1$ | | |
| **1108** | 0 | 0 |
| 1000 | (3) | 10 |
| 825 | (8) | 20 |
| 520 | (14) | 30 |
| $Mix_1 + Mix_2$ | | |
| 282E | 18 | 38 |
| | 88 | 38 |
| $Mix_2$ | | |
| 295 | (89) | 40 |
| 320 | (91) | 50 |
| 358 | (93) | 60 |
| 383 | (96) | 70 |
| 418 | (96) | 80 |
| 435 | (99) | 90 |
| **448.5** | 100 | 100 |

B = ZnS (79)

| t, °C | Wt. % B |
|---|---|
| A | |
| **1115** | 0 |
| A + B | |
| 1048E | 4 |
| B | |
| 1090 | 10 |
| 1275 | 20 |
| 1360 | 30 |
| 1405 | 40 |

B = $Cu_2S$ (80)

| | |
|---|---|
| A | |
| **1114** | 0 |
| 988 | 10 |
| 875 ↓ | 20 |
| 565 ↓ | 50 |
| A + B | |
| 550E | 51.5 |
| B | |
| 655 ↓ | 60 |
| 1055 ↓ | 90 |
| **1121** | 100 |

B = $Ag_2S$ (79)

| t, °C | Wt. % B |
|---|---|
| A | |
| **1114** | 0 |
| 1040 | 10 |
| 970 | 20 |
| 905 | 30 |
| 845 | 40 |
| 780 | 50 |
| 715 | 60 |
| 660 | 70 |
| A + B | |
| 630E | 76.5 |
| $B(\alpha)$ | |
| 655 | 80 |
| 740 | 90 |
| 835 | 100 |
| Solid state | |
| $B(\alpha) + B(\beta)$ | |
| 195 | 25–100 |

B = FeS (79)

| | |
|---|---|
| A | |
| **1114** | 0 |
| 1020 | 10 |
| 930 | 20 |
| A + B | |
| 869E | 27 |
| B | |
| 890 | 30 |
| 960 | 40 |
| 1025 | 50 |
| 1108 | 70 |
| 1163 | 90 |
| **1187** | 100 |

### $PbSO_4$

B = $PbCrO_4$ (122)

*v.* Fig. 17

B = $PbMoO_4$ (122)

| t, °C | M % A | |
|---|---|---|
| $Mix_1$ | | |
| **1065** | 0 | 0 |
| 1050 | 1 | 10 |
| 1027 | 2 | 20 |
| 1000 | 4 | 30 |
| $Mix_1 + Mix_2$ | | |
| 962E | 6 | 42.5 |
| | 97 | 42.5 |
| $Mix_2$ | | |
| 986 | (97) | 50 |
| 1016 | (98) | 60 |
| 1048 | (98) | 70 |
| 1080 | (99) | 80 |
| **(1170)** | 100 | 100 |
| Solid state | | |
| $A(\alpha) + A(\beta)$ | | |
| 879 | (4)–98 | |
| 874 | 97 | |
| 864 | 100 | |

B = $PbWO_4$ (122)

| | | |
|---|---|---|
| $Mix_1$ | | |
| **1123** | 0 | 0 |
| 1075 | 9 | 15 |
| 1035 | 16 | 30 |
| 1015 | 20 | 40 |

B = $PbWO_4$.— (*Continued*)

| t, °C | M % A | |
|---|---|---|
| $Mix_1 + Mix_2$ | | |
| 995E | 23 | 50 |
| | 94 | 50 |
| $Mix_2$ | | |
| 1020 | (95) | 60 |
| 1055 | (96) | 70 |
| 1090 | (97) | 80 |
| 1130 | (98) | 90 |
| **1170** | 100 | 100 |
| Solid state | | |
| $A(\alpha) + A(\beta)$ | | |
| 875 | 11–96 | |
| 864 | 100 | |
| $B(\alpha) + B(\beta)$ | | |
| 877 | 0 | |
| 859 | 3–95 | |

B = $Li_2SO_4$ (52)

| | |
|---|---|
| $B(\alpha)$ | |
| **856** | 0 |
| 740 | 10 |
| 662 | 20 |
| $B(\alpha) + A$ | |
| 638E | 25 |
| A | |
| 686 | 30 |
| 760 | 40 |
| 813 | 50 |
| 850* | 60 |
| **1006** | 100 |
| Solid state | |
| $B(\alpha) + B(\beta)$ | |
| 585 | 0–60 |

* Decompn. of A above 60 M %. At 856°, A transforms (?).

B = $Na_2SO_4$ (52)

| | | |
|---|---|---|
| Mix. | | |
| **887** | 0 | 0 |
| 907 | | 7 |
| 895 | (9) | 15 |
| 845 | (15) | 30 |
| 787 | (19) | 40 |
| Mix. + A | | |
| 735E | 20 | 47 |
| A | | |
| 788 | 55 | |
| 840 | 65* | |
| Solid state | | |
| Mix. + A | | |
| 700 | 18 | |
| 600 | 12 | |
| 500 | 7 | |
| 400 | 4 | |
| 300 | 3 | |
| $B(\alpha) + B(\beta)$ | | |
| 235 | 0 | |
| 225 | 2–65 | |

* Decompn. of A above 65 M %. There is a transformation of A at 856°.

B = $K_2SO_4$ (52, 94)

*v.* Fig. 18

### $Pb(NO_3)_2$

B = $NaNO_3$ (99) (A.)

| t, °C | M % A |
|---|---|
| B | |
| **305** | 0 |
| B + (?) | |
| 268E | 16.15 |

B = $KNO_3$ (99) (A.)

| | |
|---|---|
| B | |
| **320** | 0 |
| 300 | 3.28 |
| 285 | 7.11 |
| 268 | 11.58 |
| 246 | 16.92 |
| B + (?) | |
| 207E | 21.24 |
| (?) | |
| 210 | 23.42 |
| 238 | 31.44 |
| (335) (?) | 41.63 |

### $Pb_3(PO_4)_2$

B = $Pb_3(AsO_4)_2$ (16) (A.)

| t, °C | M % B |
|---|---|
| Mix. | |
| **1014** | 0 |
| 1020 | 23.12 |
| 1028 | 47.42 |
| 1035 | 73.04 |
| **1042** | 100 |

B = $Pb_3(VO_4)_2$ (16) (A.)

| | |
|---|---|
| Mix. | |
| **1014** | 0 |
| 996 | 24.10 |
| 980 | 48.79 |
| 962 | 84.37 |
| **952** | 100 |

### $3Pb_3(PO_4)_2.PbF_2$

B = $3Pb_3(PO_4)_2.$-$PbCl_2$ (16) (A.)

| | |
|---|---|
| Mix. | |
| **1098** | 0 |
| 1108 | 19.80 |
| 1126 | 49.70 |
| 1144 | 79.80 |
| **1156** | 100 |

B = $3Pb_3(AsO_4)_2.$-$PbF_2$ (16) (A.)

| | |
|---|---|
| Mix. | |
| **1098** | 0 |
| 1086 | 23.28 |
| 1072 | 47.66 |
| 1058 | 73.20 |
| **1042** | 100 |

B = $3Pb_3(VO_4)_2.$-$PbF_2$ (16) (A.)

| | |
|---|---|
| Mix. | |
| **1098** | 0 |
| 1052 | 24.18 |
| 1012 | 48.90 |
| 960 | 74.16 |

B = $3Pb_3(VO_4)_2.$-$PbF_2$.—(*Continued*)

| t, °C | M % B |
|---|---|
| Mix. | |
| 935 | 89.60 |
| **916** | 100 |

### $3Pb_3(PO_4)_2.PbCl_2$

B = $3Pb_3(AsO_4)_2.$-$PbCl_2$ (16) (A.)

| | |
|---|---|
| Mix. | |
| **1156** | 0 |
| 1152 | 28.08 |
| 1150 | 47.67 |
| 1145 | 78.46 |
| **1140** | 100 |

B = $3Pb_3(VO_4)_2.$-$PbCl_2$ (16) (A.)

| | |
|---|---|
| Mix. | |
| **1156** | 0 |
| 1116 | 19.30 |
| 1056 | 48.90 |
| 1012 | 79.30 |
| **990** | 100 |

### $Pb_3(AsO_4)_2$

B = $Pb_3(VO_4)_2$ (16) (A.)

| | |
|---|---|
| Mix. | |
| **1042** | 0 |
| 1018 | 26.04 |
| 994 | 51.36 |
| 968 | 76.00 |
| 960 | 90.48 |
| **952** | 100 |

### $3Pb_3(AsO_4)_2.$-$PbF_2$

B = $3Pb_3(AsO_4)_2.$-$PbCl_2$ (16) (A.)

| | |
|---|---|
| Mix. | |
| **1042** | 0 |
| 1060 | 9.89 |
| 1087 | 29.76 |
| 1107 | 49.72 |
| 1128 | 79.82 |
| **1140** | 100 |

B = $3Pb_3(VO_4)_2.$-$PbF_2$ (16) (A.)

| | |
|---|---|
| Mix. | |
| **1042** | 0 |
| 1008 | 25.96 |
| 978 | 51.25 |
| 944 | 75.92 |
| **916** | 100 |

### $3Pb_3(AsO_4)_2.$-$PbCl_2$

B = $3Pb_3(VO_4)_2.$-$PbCl_2$ (16) (A.)

| | |
|---|---|
| Mix. | |
| **1140** | 0 |
| 1096 | 20.80 |
| 1062 | 51.24 |
| 1010 | 80.78 |
| **990** | 100 |

### $PbCrO_4$

B = $PbMoO_4$ (122)

| t, °C | M % B | |
|---|---|---|
| $Mix_1$ | | |
| **844** | 0 | 0 |
| $Mix_1 + Mix_2$ | | |
| 838E | 2 | (22) |
| | 53 | (22) |
| $Mix_2$ | | |
| 872 | 60 | (30) |
| 920 | 70 | (43) |
| 970 | 80 | (60) |
| 1020 | 90 | (80) |
| **1065** | 100 | 100 |
| Solid state | | |
| $A(\alpha) + A(\beta)$ | | |
| 783 | 0 | |
| 799 | 2–53 | |
| $A(\beta) + A(\gamma)$ | | |
| 707 | 0 | |
| 697 | 28–57 | |

B = $PbWO_4$ (122)

| | | |
|---|---|---|
| $Mix_1$ | | |
| **844** | 0 | 0 |
| $Mix_1 + Mix_2$ | | |
| 837E | 2 | (23) |
| | 59.5 | (23) |
| $Mix_2$ | | |
| 935 | 70 | (46) |
| 1010 | 80 | (66) |
| 1070 | 90 | (84) |
| **1123** | 100 | 100 |

### $PbMoO_4$

B = $PbWO_4$ (122)

| | | |
|---|---|---|
| $Mix_1$ | | |
| **1065** | 0 | 0 |
| 1070 | 21 | 10 |
| 1076 | 35 | 20 |
| 1080 | 41 | 30 |
| $Mix_1 + Mix_2$ | | |
| 1082U | 43 | 35 |
| | 60 | 35 |
| $Mix_2$ | | |
| 1093 | 72 | 50 |
| 1100 | 79 | 60 |
| 1107 | 85 | 70 |
| 1112 | 90 | 80 |
| 1118 | 95 | 90 |
| **1123** | 100 | 100 |

B = $Y_2(MoO_4)_3$ (274)

| t, °C | M % A |
|---|---|
| B | |
| **1347** | 0 |
| 1285 | 20 |
| 1235 | 30 |
| 1130 | 45 |
| 1030 | 55 |
| B + A | |
| 975E | 59 |
| A | |
| 1012 | 70 |
| 1030 | 80 |
| 1040 | 90 |
| **1065** | 100 |

B = $La_2(MoO_4)_3$ (274)

| t, °C | M % A |
|---|---|
| Mix. | |
| **1181** | 0 \| 0 |
| 1168 | 6 \| 10 |
| 1153 | 15 \| 20 |
| 1135 | 27 \| 30 |
| 1118 | 36 \| 40 |
| 1104 | 45 \| 50 |
| 1093 | 54 \| 60 |
| 1084 | 62 \| 70 |
| 1076 | 70 \| 80 |
| 1070 | 80 \| 90 |
| **1065** | 100 \| 100 |

B = $Ce_2(MoO_4)_3$ (274)

| t, °C | M % B |
|---|---|
| Mix. | |
| **1065** | 0 |
| 1070 | 5 |
| 1073 | 13 |
| 1068 | 20 |
| 1056 | 30 |
| 1042 | 40 |
| 1028 \| (30) | 50 |
| 1012 \| (40) | 60 |
| 996 \| (50) | 70 |
| 977 \| (70) | 80 |
| 951 \| (85) | 90 |
| Mix. + B | |
| 938E \| 94 | 94 |
| B | |
| **973** | 100 |

B = $Pr_2(MoO_4)_3$ (274)

| t, °C | M % A |
|---|---|
| Mix. | |
| **1030** | 0 \| 0 |
| 1035 | 18 \| 10 |
| 1039 | 30 \| 20 |
| 1042 | 38 \| 30 |
| 1045 | 47 \| 40 |
| 1050 | 57 \| 50 |
| 1056 | 67 \| 60 |
| 1066 | 75 \| 70 |
| 1069 | 80 |
| 1066 | 80 |
| 1073 | 90 |
| 1068 | 90 |
| **1065** | 100 \| 100 |

B = $Nd_2(MoO_4)_3$ (275)

| t, °C | M % B |
|---|---|
| Mix. | |
| **1176** | 0 \| 0 |
| 1161 | 10 \| 20 |
| 1146 | 23 \| 35 |
| 1126 | 42 \| 50 |
| 1112 | 53 \| 60 |
| 1096 | 64 \| 70 |
| 1083 | 74 \| 80 |
| 1071 | 83 \| 90 |
| **1065** | 100 \| 100 |

B = $(NdPr)_2(MoO_4)_3$ (274)

| t, °C | M % A |
|---|---|
| Mix. | |
| **1125–1144** | 0 \| 0 |
| 1133 | 20 |
| 1127 | 30 |
| 1120 | (3) \| 40 |
| 1112 | (8) \| 50 |
| 1102 | (18) \| 60 |
| 1091 | (31) \| 70 |
| 1082 | (53) \| 80 |
| 1075 | (65) \| 90 |
| **1065** | 100 \| 100 |

## $PbWO_4$

B = $Ce_2(WO_4)_3$ (274)

| | |
|---|---|
| Mix. | |
| **1089** | 0 \| 0 |
| 1093 | (28) \| 10 |
| 1097 | (60) \| 20 |
| 1101 | (72) \| 30 |
| 1106 | (81) \| 40 |
| 1112 | (90) \| 50 |
| 1115 | (93) \| 60 |
| 1119 | (96) \| 70 |
| 1121 | (98) \| 80 |
| 1123 | (99) \| 90 |
| **1125** | 100 \| 100 |

## $3Pb_3(VO_4)_2.PbF_2$

B = $3Pb_3(VO_4)_2$.-$PbCl_2$ (16) (A.)

| t, °C | M % B |
|---|---|
| Mix. | |
| **916** | 0 |
| 942 | 24.78 |
| 964 | 49.70 |
| 978 | 74.78 |
| **990** | 100 |

## TlCl

B = TlBr (162)

| | |
|---|---|
| Mix. + liq. | |
| **426** | 0 |
| 422 | 10 |
| 418 | 20 |
| 415 | 30 |
| 413 | 40 |
| 415 | 50 |
| 420 | 60 |
| 426 | 70 |
| 434 | 80 |
| 442 | 90 |
| **450** | 100 |

B = TlI (162)

| | | |
|---|---|---|
| Mix$_1$ | | |
| **426** ↓ 330 | 0 \| (1.5) | 0 \| 40 |
| Mix$_1$ + Mix$_2$ | | |
| 316E | 2 \| 83 | 47 \| 47 |
| Mix$_2$ | | |
| 338 ↓ **431** | (86) \| 100 | 60 \| 100 |

B = $ZnCl_2$ (137)

| t, °C | M % B |
|---|---|
| A | |
| **435** | 0 |
| 403 | 10 |
| A + $A_2B$ | |
| 335E | 23 |
| $A_2B$ | |
| **352** | 33.3 |
| 332 | 40 |
| 235 | 50 |
| $A_2B$ + $AB_2$ | |
| 193E | 52 |
| $AB_2$ | |
| 219 | 60 |
| **226** | 66.7 |
| $AB_2$ + Mix. | |
| 215E \| 95 | 70 |
| Mix. | |
| 260 \| 98 | 80 |
| 271 \| 99 | 90 |
| **275** \| 100 | 100 |

B = $CdCl_2$ (137, 229)

| | |
|---|---|
| A | |
| **429** | 0 |
| 382 | 10 |
| 334 | 20 |
| A + AB | |
| 298E | 28.5 |
| AB | |
| 316 | 30 |
| 390 | 40 |
| **426** | 50 |
| 419 | 60 |
| AB + B | |
| 400E | 65.5 |
| B | |
| 424 | 70 |
| 478 | 80 |
| 527 | 90 |
| **568** | 100 |

B = $HgCl_2$ (229)

| | |
|---|---|
| A | |
| **429** | 0 |
| 374 | 10 |
| 294 | 20 |
| A + $A_4B$ | |
| 250U | 23 |
| $A_4B$ | |
| 222 | 30 |
| $A_4B$ + Mix$_1$ | |
| 201E \| 43 | 32.5 |
| Mix$_1$ | |
| 220 \| (48) | 40 |
| AB | |
| **225** | 50 |
| Mix$_2$ | |
| 200 \| (52) | 60 |
| Mix$_2$ + Mix$_3$ | |
| 183E \| (53) | 64 |
| 76 | 64 |

B = $HgCl_2$.— (*Continued*)

| t, °C | M % B |
|---|---|
| Mix$_3$ | |
| 209 \| 81 | 70 |
| 241 \| 90 | 80 |
| 262 \| 96 | 90 |
| **275** \| 100 | 100 |

$k_B$ = 35.0 (0.06) (27) (A.).

B = CuCl (229)

| | |
|---|---|
| Mix$_1$ | |
| **429** | 0 \| 0 |
| 390 | (2) \| 10 |
| 350 | (3) \| 20 |
| 305 | (5) \| 30 |
| 260 | (6) \| 40 |
| Mix$_1$ + $A_2B$ | |
| 225U | 7 \| 47.5 |
| | 33.3 \| 47.5 |
| Mix$_2$ | |
| 215 \| (34) | 50 |
| 178 \| (35) | 55 |
| Mix$_2$ + B | |
| 124E \| 37 | 61.5 |
| B | |
| 242 | 70 |
| 310 | 80 |
| 362 | 90 |
| **422** | 100 |

B = AgCl (229)

| t, °C | M % A |
|---|---|
| B | |
| **454** | 0 |
| 461 | 10 |
| 362 | 20 |
| 298 | 30 |
| 220 | 40 |
| B + $B_2A_3$ | |
| 210E | 42 |
| $B_2A_3$ | |
| 236 | 50 |
| $B_2A_3$ + A | |
| **253**UE | 60 |
| A | |
| 316 | 70 |
| 360 | 80 |
| 396 | 90 |
| **429** | 100 |

B = $FeCl_3$ (233)

| t, °C | M % B |
|---|---|
| A | |
| **429** | 0 |
| 397 | 10 |
| 335 | 20 |
| A + $A_2B$ | |
| 262E | 26.5 |
| $A_2B$ | |
| 280 | 30 |
| **290** | 33.3 |
| $A_2B$ + B (?) | |
| 220E | 38 |
| B (?) | |
| 255 | 45 |
| 286 | 55 |
| 300 | 62 |

B = $AlCl_3$ (130) (A.)

M. c. t.

| t, °C | M % A |
|---|---|
| B | |
| **190.2** | 0 |
| 189.4 | 0.52 |
| $B_xA$ | |
| 189.4 | 0.9 |
| 192.0 | 1.2* |
| 192.0 | 14.7 |
| 190.2 | 15.6 |
| 182.3 | 18.7 |
| 172.8 | 21.8 |
| 158.8 | 26.1 |
| $B_2A$ | |
| 160.5 | 28.2 |
| 162.9 | 29.2 |
| BA | |
| 172.6 | 31.4 |
| 196.6 | 33.1 |
| 211.4 | 34.2 |
| 248.1 | 37.9 |
| 274.1 | 42.1 |
| 290.0 | 46.2 |
| **297.0** | 50.0 |
| 295.5 | 51.2 |
| 288.1 | 53.5 |
| A | |
| 325.0 | 55.5 |
| 360.0 | 56.5 |

* Two liq. layers from 1.2 to 14.7.

B = $BeCl_2$ (280)

B = $MgCl_2$ (137)

| t, °C | M % B |
|---|---|
| A | |
| **436** | 0 |
| 418 | 10 |
| 388 | 20 |
| A + $AB_2$ | |
| 361E | 26 |
| $AB_2$ | |
| 425 | 35 |
| 485 | 50 |
| $AB_2$ + B | |
| 498U | 63 |
| B | |
| 550 | 70 |
| 625 | 80 |
| 677 | 90 |
| **718** | 100 |

B = $CaCl_2$ (137)

| | |
|---|---|
| A | |
| **435** | 0 |
| A + AB | |
| 419E | 7 |
| AB | |
| 565 | 15 |
| 674 | 35 |
| **683** | 50 |
| 667 | 60 |
| AB + B | |
| 648E | 67 |

B = $CaCl_2$.— (*Continued*)

| t, °C | M % B |
|---|---|
| B | |
| 665 | 70 |
| 715 | 80 |
| 753 | 90 |
| **782** | 100 |

B = $SrCl_2$ (137)

| | |
|---|---|
| A | |
| **435** | 0 |
| A + AB | |
| 416E | 11.5 |
| AB | |
| 475 | 20 |
| 530 | 30 |
| 563 | 40 |
| AB + B | |
| 568U | 47 |
| B | |
| 660 | 60 |
| 720 | 70 |
| 798 | 85 |
| **872** | 100 |

B = $BaCl_2$ (137)

| | |
|---|---|
| A | |
| **435** | 0 |
| A + B | |
| 430E | <1 |
| B($\beta$) | |
| 590 | 10 |
| 670 | 20 |
| 730 | 30 |
| 825 | 50 |
| 905 | 70 |
| B($\beta$) + B($\alpha$) | |
| 925 | 76 |
| B($\alpha$) | |
| 940 | 80 |
| 955 | 90 |
| **962** | 100 |

B = LiCl (229)

| t, °C | M % A |
|---|---|
| B | |
| **602** ↓ 352 | 0 \| 60 |
| B + A | |
| 342E | 62.5 |
| A | |
| 370 | 70 |
| 415 | 90 |
| **429** | 100 |

B = NaCl (229)

| | |
|---|---|
| B | |
| **805** | 0 |
| 765 | 10 |
| 715 | 25 |
| 673 | 40 |
| 640 | 50 |
| 565 | 65 |
| 495 | 75 |
| B + A | |
| 412E | 85 |
| A | |
| 423 | 90 |
| **429** | 100 |

### TlCl.—(*Cont'd*)

B = KCl (229)

| *t*, °C | M % A |
|---|---|
| Mix. | |
| **776** | 0 \| 0 |
| 747 | (6) \| 10 |
| 715 | (11) \| 20 |
| 652 | (23) \| 40 |
| 618 | (30) \| 50 |
| 583 | (37) \| 60 |
| 545 | (46) \| 70 |
| 508 | (55) \| 80 |
| 470 | (65) \| 90 |
| 449 | 73 \| 95 |
| **429** | 100 \| 100 |

B = RbCl (229)

| | |
|---|---|
| Mix. | |
| **716** | 0 \| 0 |
| 685 | (3) \| 10 |
| 660 | (6) \| 20 |
| 635 | (8) \| 30 |
| 605 | (12) \| 40 |
| 570 | (16) \| 50 |
| 530 | (23) \| 60 |
| 490 | (31) \| 70 |
| 460 | (40) \| 80 |
| 438 | (52) \| 90 |
| 432 | 65 \| 95 |
| **429** | 100 \| 100 |

B = CsCl (229)

| | |
|---|---|
| $Mix_1$ | |
| **639** | 0 \| 0 |
| 595 | (5) \| 10 |
| 557 | (8) \| 20 |
| 532 | (10) \| 30 |
| 500 | (11) \| 40 |
| $Mix_1 + Mix_2$ | |
| 466U | 12 \| 43.5 |
| | (20) \| 43.5 |
| $Mix_2$ | |
| 450 | (24) \| 50 |
| 410 | (43) \| 60 |
| 393 | 60 \| 70 |
| $Mix_2 + Mix_3$ | |
| 390 | 75 \| 75 |
| $Mix_3$ | |
| 400 | 90 \| 80 |
| 418 | 97 \| 90 |
| **429** | 100 \| 100 |
| Solid state | |
| $B(\alpha) + B(\beta)$ | |
| 450 | 0 |
| 460 | 10–(17) |
| 466 | 12–(20) |

### TlBr

B = TlI (162)

| *t*, °C | M % B |
|---|---|
| Mix. + liq. | |
| **450** | 0 |
| 441 | 10 |
| 430 | 20 |
| 421 | 30 |
| 415 | 40 |
| 412 | 50 |

B = TlI.—(*Continued*)

| *t*, °C | M % B |
|---|---|
| Mix. + liq. | |
| 411 | 60 |
| 413 | 70 |
| 417 | 80 |
| 424 | 90 |
| **431** | 100 |

B = $HgBr_2$ (98) (A.)

| *t*, °C | M % A |
|---|---|
| B | |
| **235.0** | 0 |
| 233.3 | 2.08 |
| 232.1 | 3.70 |
| 230.9 | 4.92 |

$k_B$ = 28.3 (0.14).

B = $AlBr_3$ (130) (A.)

| | |
|---|---|
| M. c. t. | |
| B | |
| **97.1** \| | 0 |
| $B_2A$ | |
| 103.9 | 0.6* |
| 103.9 | 22.8 |
| 99.9 | 24.4 |
| $B_2A$ | |
| 104.4 | 24.4 |
| 105.9 | 26.0 |
| 108.1 | 28.4 |
| 111.8 | 32.7 |
| **112.0** | 33.3 |
| BA | |
| 126.8 | 35.4 |
| 142.1 | 37.6 |
| 160.4 | 40.7 |
| 192.9 | 46.3 |
| 203.4 | 48.2 |
| **210.0** | 50.0 |
| 217.9 | 51.0 |
| 200.8 | 52.1 |
| 193.1 | 53.3 |
| A | |
| 213.8 | 55.0 |
| 215.9 | 55.2 |

* Two liq. layers from 0.6 to 22.8.

### TlI

B = $TlNO_3$ (71)

| *t*, °C | M % B |
|---|---|
| $Mix_1$ | |
| **422** | 0 \| 0 |
| 406 | 4 \| 10 |
| 392 | 7.5 \| 20 |
| 376 | 11.5 \| 30 |
| 360 | 15 \| 40 |
| 342 | 19.5 \| 50 |
| 322 | 24 \| 60 |
| 296 | 28 \| 70 |
| 266 | 32 \| 80 |
| $Mix_1 + Mix_2$ | |
| 215U | 36 \| 90 |
| | 81 \| 90 |
| $Mix_2$ | |
| 208 | 87 \| 95 |
| **206** | 100 \| 100 |

### $Tl_2S$

B = $Ag_2S$ (115)

| *t*, °C | M % A |
|---|---|
| B | |
| **781** | 0 |
| 610 | 10 |
| 495 | 20 |
| $B + B_4A$ | |
| 358U | 29 |
| $B_4A$ | |
| 326 | 35 |
| $B_4A + A$ | |
| 308E | 37.5 |
| A | |
| 319 | 40 |
| 358 | 50 |
| 385 | 60 |
| 405 | 70 |
| 422 | 80 |
| 436 | 90 |
| **448** | 100 |

### $TlNO_2$

B = $TlNO_3$ (67); *v.* Fig. 19

| | |
|---|---|
| Mix. | |
| **206** | 0 \| 0 |
| 202 | 2 \| 10 |
| 199 | 5 \| 20 |
| 195 | 8 \| 30 |
| 191 | 12 \| 40 |
| 185 | 19 \| 50 |
| 175 | 37 \| 60 |
| 167 | 50 \| 70 |
| 161 | 60 \| 80 |
| 156 | 68 \| 90 |
| 146 | 90 |
| **149** | 100 \| 100 |
| Solid state | |
| $B(\alpha) + B(\beta)$ | |
| 143 | 0 |
| 106 | 5–7 |
| $A(\alpha) + B(\beta)$ | |
| 112 | 81–90 |
| 120 | 92–95 |
| 131 | 100 |

### $TlNO_3$

B = $AgNO_3$ (70) (A.)

| *t*, °C | M % B |
|---|---|
| $A(\alpha)$ | |
| **206** | 0 |
| 180 | 10 |
| 153 | 20 |
| $A(\alpha) + A(\beta)$ | |
| 142 | 25 |
| $A(\beta)$ | |
| 129 | 30 |
| 105 | 40 |
| $A(\beta) + AB$ | |
| 81E | 47.5 |
| AB | |
| **83** | 50 |
| $AB + B(\beta)$ | |
| 81E | 53 |
| $B(\beta)$ | |
| 109 | 60 |
| 140 | 70 |

B = $AgNO_3$.—(*Continued*)

| *t*, °C | M % B |
|---|---|
| $B(\beta) + B(\alpha)$ | |
| 159 | 77.5 |
| $B(\alpha)$ | |
| 166 | 80 |
| 189 | 90 |
| **208** | 100 |
| Solid state | |
| $A(\beta) + A(\gamma)$ | |
| 79 | 0– 50 |
| $AB(\alpha) + AB(\beta)$ | |
| 26 | 0–100 |

B = $NaNO_3$ (70)

| | |
|---|---|
| $A(\alpha)$ | |
| **206** | 0 |
| $A(\alpha) + B$ | |
| 162E | 20.5 |
| B | |
| 182↓ | 30 |
| 240↓ | 60 |
| 265 | 75 |
| 278 | 85 |
| **308** | 100 |
| Solid state | |
| $A(\alpha) + A(\beta)$ | |
| 142 | 0–100 |
| $A(\beta) + A(\gamma)$ | |
| 79 | 0–100 |

B = $KNO_3$ (70) *v.* Fig. 20

### $ZnF_2$

B = NaF (205) (A.)

| *t*, °C | M % A |
|---|---|
| B | |
| **1040** | 0 |
| 983 | 5.5 |
| 940 | 13.5 |
| 905 | 23.0 |
| B + (?) | |
| 660, 680 E | (?) |
| A | |
| **872** | 100 |

### $ZnCl_2$

B = $CdCl_2$ (110)

| | |
|---|---|
| B | |
| **568** | 0 |
| 553 | 15 |
| 473 | 55 |
| 390 | 75 |
| 305 | 90 |
| B + A | |
| 262E | >99 |
| A | |
| **262** | 100 |

B = CuCl (110)

| | |
|---|---|
| $Mix_1$ | |
| **424** | 0 \| 0 |
| 400 | (3) \| 15 |
| 382 | (5) \| 25 |
| 330 | (10) \| 50 |
| 283 | (13) \| 70 |

B = CuCl.—(*Continued*)

| *t*, °C | M % A |
|---|---|
| $Mix_1 + Mix_2$ | |
| 242E | 14 \| 87 |
| | 95 \| 87 |
| $Mix_2$ | |
| 248 | (96) \| 90 |
| **261** | 100 \| 100 |

B = $FeCl_3$ (110)

| | |
|---|---|
| B | |
| **298** | 0 |
| 288 | 10 |
| 268 | 30 |
| 245 | 50 |
| B + A | |
| 214E | 73 |
| A | |
| 245 | 90 |
| **261** | 100 |

B = $MnCl_2$ (229)

| *t*, °C | M % B |
|---|---|
| A | |
| **275** | 0 |
| A + B | |
| 275E | <1 |
| B | |
| 330 | 10 |
| 380 | 20 |
| 420 | 30 |
| 460 | 40 |
| 495 | 50 |
| 530 | 60 |
| 560 | 70 |
| 590 | 80 |
| 620 | 90 |
| **650** | 100 |

B = $MgCl_2$ (159)

| *t*, °C | M % A |
|---|---|
| B | |
| **711** | 0 |
| 695 | 10 |
| 655 | 30 |
| 545 | 70 |
| 485 | 85 |
| 405 | 95 |
| B + A | |
| 271E | >99 |
| A | |
| **271** | 100 |

B = $CaCl_2$ (159)

| | |
|---|---|
| B | |
| **777** | 0 |
| 745 | 10 |
| 710 | 20 |
| 670 | 30 |
| 635 | 40 |
| 590 | 50 |
| 550 | 60 |
| 500 | 70 |
| 450 | 80 |
| 385 | 90 |
| B + A | |
| 274E | (100) |
| A | |
| **274** | 100 |

B = $SrCl_2$ (229)

| *t*, °C | M % B |
|---|---|
| A | |
| **275** | 0 |
| A + AB | |
| 275 | <1 |
| AB | |
| 360 | 10 |
| 425 | 20 |
| 460 | 30 |
| AB + B | |
| 476U | 46 |
| B | |
| 600 | 60 |
| 675 | 70 |
| 745 | 80 |
| **872** | 100 |

B = $BaCl_2$ (229)

| | |
|---|---|
| A | |
| **275** | 0 |
| A + AB | |
| 275 | <1 |
| AB | |
| 385 | 10 |
| 435 | 20 |
| 460 | 30 |
| AB + B(β) | |
| 470U | 45 |
| B(β) | |
| 550 | 50 |
| 660 | 60 |
| 750 | 70 |
| 825 | 80 |
| 895 | 90 |
| B(β) + B(α) | |
| 923 | 94 |
| B(α) | |
| **960** | 100 |

### $ZnBr_2$

B = $AlBr_3$ (117, 130) (A.)

| | |
|---|---|
| M. c. t. | |
| *t*, °C | M % A |
| B | |
| **93.0** | 0 |
| 89.4 | 3.46 |
| 87.9 | 5.05 |
| 82.1 | 9.49 |
| **97.1** | 0 |
| 94.4 | 5.6 |
| 87.6 | 11.3 |
| 83.5m | 14.5 |
| $B_2A$ | |
| 95.1 | 11.3 |
| 99.3 | 14.5 |
| 104.1 | 20.6 |
| 110.4 | 30.0 |
| **111.5** | 33.3 |
| 110.6 | 35.1 |

$k_B$ = 25.6 (0.39).

### ZnS

B = $Cu_2S$ (81)

*v.* Fig. 21

B = $Ag_2S$ (81)

| $t$, °C | Wt. % A |
|---|---|
| B | |
| **843** | 0 |
| B + A | |
| 800E | 3 |
| A | |
| 1035 | 10 |
| 1195 | 20 |
| 1295 | 30 |
| 1358 | 40 |
| 1412 | 50 |
| 1460 | 60 |
| 1515 | 70 |
| 1575 | 80 |

B = FeS (81)

| | |
|---|---|
| B | |
| **1188** | 0 |
| B + A | |
| 1180E | 6 |
| A | |
| 1270 | 10 |
| 1410 | 20 |
| 1510 | 40 |
| 1550 | 80 |

## $Zn(CN)_2$

B = KCN (256)

| $t$, °C | M % B |
|---|---|
| A* + $AB_2$ | |
| 515E | 52 |
| $AB_2$ | |
| 530 | 60 |
| **538** | 66.7 |
| 515 | 75 |
| $AB_2$ + B | |
| 487E | 80 |
| B | |
| **574** | 90 |
| **622** | 100 |

* Under 50 M % B, A decomposes.

## CdO

B = $B_2O_3$ (156) (A.)

| (?) | |
|---|---|
| 940 | 30.30 |
| 905 | 37.95 |
| 810 | 44.00 |
| (?) + AB | |
| 750E | 46.65 |
| AB | |
| 845 | 48.60 |
| 850 | 50.25 |
| 810 | 51.60 |
| 770 | 52.40 |
| AB + $A_2B_3$ | |
| 710E | 55.50 |
| $A_2B_3$ | |
| 750 | 57.25 |
| 810 | 58.05 |
| 855 | 60.30 |
| 755 | 63.80 |

## $CdF_2$

B = $CdI_2$ (219) (A.)

| $t$, °C | M % B |
|---|---|
| (?) | |
| >1000 | 0 |
| 340* | 90 |
| **350** | 100 |

* Minimum $t_f$.

B = NaF (205)

| $t$, °C | M % A |
|---|---|
| B | |
| **1040** | 0 |
| 990 | 10 |
| 955 | 15 |
| 880 | 25 |
| 785 | 35 |
| B + A | |
| 660E | 46 |
| A | |
| 750 | 55 |
| 885 | 70 |
| 1040 | 90 |
| **1110** | 100 |

$k_B$ = 18.9 (0.37) (A.).

## $CdCl_2$

B = $CdBr_2$ (167)

| Mix. + liq. | |
|---|---|
| **567** | 0 |
| 558 | 10 |
| 553 | 20 |
| 552 | 30 |
| 550.5 | 40 |
| 551 | 50 |
| 552 | 60 |
| 554 | 70 |
| 556 | 80 |
| 559 | 90 |
| **563** | 100 |

B = $CdI_2$ (167)

| $t$, °C | M % A | |
|---|---|---|
| $Mix_1$ | | |
| **385** | 0 | 0 |
| 368 | (1.5) | 20 |
| $Mix_1$ + $Mix_2$ | | |
| 359E | (2) | 30 |
| | (96) | 30 |
| $Mix_2$ | | |
| 386 | (96.5) | 40 |
| **563** | 100 | 100 |

B = $CdSO_4$ (219) (A.)

| $t$, °C | M % B |
|---|---|
| (?) | |
| **590** | 0 |
| 565* | 15 |
| **1000** | 100 |

* Minimum $t_f$.

B = CuCl (110)

| $t$, °C | M % A | |
|---|---|---|
| $Mix_1$ | | |
| **424** | 0 | 0 |
| 415 | 5 | 10 |
| $Mix_1$ + $Mix_2$ | | |
| 410 | 14 | 14 |

B = CuCl.—(*Continued*)

| $t$, °C | M % A | |
|---|---|---|
| $Mix_2$ | | |
| 422 | 33 | 20 |
| 437 | 44 | 30 |
| 451 | 53 | 40 |
| 467 | 63 | 50 |
| 486 | 72 | 60 |
| 507 | 81 | 70 |
| 525 | 87 | 80 |
| 544 | 93 | 90 |
| **568** | 100 | 100 |
| Solid state | | |
| Mix. + $AB_4$ | | |
| 305 | 10 | |
| 350 | 20 | |
| 325 | 35 | |
| 315 | 50 | |

B = $MnCl_2$ (229)

| Mix. | | |
|---|---|---|
| **650** | 0 | 0 |
| 638 | 6 | 10 |
| 628 | 12 | 20 |
| 618 | 18 | 30 |
| 608 | 25 | 40 |
| 598 | 32 | 50 |
| 590 | 40 | 60 |
| 583 | 49 | 70 |
| 576 | 63 | 80 |
| 571 | 77 | 90 |
| **568** | 100 | 100 |

B = $BeCl_2$ (280)

B = $MgCl_2$ (159)

| Mix. | | |
|---|---|---|
| **711** | 0 | 0 |
| 695 | 5 | 10 |
| 680 | 11 | 20 |
| 665 | 17 | 30 |
| 648 | 24 | 40 |
| 630 | (31) | 50 |
| 613 | (38) | 60 |
| 597 | (47) | 70 |
| 583 | 59 | 80 |
| 573 | 73 | 90 |
| **563** | 100 | 100 |

B = $CaCl_2$ (229)

| $Mix_1$ | | |
|---|---|---|
| **772** | 0 | 0 |
| 748 | (6) | 10 |
| 720 | (13) | 20 |
| 683 | (23) | 30 |
| 650 | (33) | 40 |
| 618 | (43) | 50 |
| 590 | (53) | 60 |
| 565 | 64 | 70 |
| 550 | 75 | 80 |
| $Mix_1$ + $Mix_2$ | | |
| 545 | 85 | 85 |
| $Mix_2$ | | |
| 550 | 95 | 90 |
| **568** | 100 | 100 |

B = $SrCl_2$ (229)

| $t$, °C | M % A |
|---|---|
| B | |
| **872** | 0 |
| 800 | 10 |
| 730 | 20 |
| 660 | 30 |
| 590 | 40 |
| 540 | 50 |
| B + A | |
| 503E | 60 |
| A | |
| 515 | 70 |
| 530 | 80 |
| 550 | 90 |
| **568** | 100 |

B = $BaCl_2$ (229)

| B($\alpha$) | |
|---|---|
| **960** | 0 |
| B($\alpha$) + B($\beta$) | |
| 923 | 4 |
| B($\beta$) | |
| 895 | 10 |
| 830 | 20 |
| 745 | 30 |
| 650 | 40 |
| 543 | 50 |
| B($\beta$) + A | |
| 450E | 58 |
| A | |
| 455 | 60 |
| 490 | 70 |
| 520 | 80 |
| 545 | 90 |
| **568** | 100 |

B = NaCl (42)

| $t$, °C | M % B |
|---|---|
| A | |
| **562** | 0 |
| 535 | 10 |
| 505 | 20 |
| 463 | 30 |
| 417 | 40 |
| A + $AB_2$ | |
| 392E | 45 |
| $AB_2$ | |
| 407 | 50 |
| $AB_2$ + B | |
| 423U | 57 |
| B | |
| 485 | 60 |
| 610 | 70 |
| 695 | 80 |
| 755 | 90 |
| **798** | 100 |

B = KCl (42)

| A | |
|---|---|
| **562** | 0 |
| 550 | 10 |
| 498 | 20 |
| 418 | 30 |
| A + AB | |
| 383E | 33 |

B = KCl.—(*Cont'd*)

| $t$, °C | M % B |
|---|---|
| AB | |
| 415 | 40 |
| **431** | 50 |
| 410 | 60 |
| AB + $AB_4$ | |
| 390E | 63 |
| $AB_4$ + B | |
| 461U | 68.5 |
| B | |
| 560 | 75 |
| 625 | 80 |
| 720 | 90 |
| **774** | 100 |

## $CdBr_2$

B = $CdI_2$ (167)

| Mix. | | |
|---|---|---|
| **567** | 0 | 0 |
| 545 | (5) | 10 |
| 520 | (11) | 20 |
| 495 | (18) | 30 |
| 470 | (27) | 40 |
| 450 | (37) | 50 |
| 430 | (49) | 60 |
| 410 | (65) | 70 |
| 400 | (76) | 80 |
| 390 | | 90 |
| **385.5** | | 100 |

B = CuBr (110)

| $t$, °C | M % A | |
|---|---|---|
| Mix. | | |
| **484** | 0 | 0 |
| 460 | 5 | 10 |
| 440 | 14 | 20 |
| 431 | 20 | 30 |
| 428 | 22 | 40 |
| 420 | 50 | 50 |
| Mix. + A($\alpha$) | | |
| 420E | 50 | |
| A($\alpha$) | | |
| 465 | 60 | |
| 498 | 70 | |
| 523 | 80 | |
| 547 | 90 | |
| **568** | 100 | |
| Solid state | | |
| A($\alpha$) + A($\beta$) | | |
| 394 | 0 | |
| 366 | 10 | |
| 355 | 20 | |
| 350 | 30 | |
| 350 | 60 | |
| 346 | 70 | |
| 344 | 85 | |

B = $AlBr_3$ (130) (A.)

| M. c. t. | |
|---|---|
| B | |
| **97.1** | 0 |
| 95.6 | 0.7 |
| $B_2A$ | |
| 140.7 | 1.1 |
| 168.1 | 1.8 |
| 189.6 | 4.5 |

B = $AlBr_3$.—(*Continued*)

| $t$, °C | M % A |
|---|---|
| $B_2A$ | |
| 192.9 | 9.0 |
| 197.0 | 13.0 |
| 204.2 | 19.3 |
| 217.4 | 26.0 |
| 224.0 | 33.1 |
| **224.0** | 33.3 |
| 223.1 | 35.3 |
| A | |
| 234.9 | 35.3 |

B = NaBr (44)

| $t$, °C | M % B |
|---|---|
| A | |
| **567** | 0 |
| 545 | 10 |
| 518 | 20 |
| 485 | 30 |
| 440 | 40 |
| 388 | 50 |
| A + B | |
| 367E | 54 |
| B | |
| 455 | 60 |
| 550 | 70 |
| 630 | 80 |
| 695 | 90 |
| **746** | 100 |

B = KBr (44)

| A | |
|---|---|
| **567** | 0 |
| 540 | 10 |
| 505 | 20 |
| 460 | 30 |
| 395 | 40 |
| A + AB | |
| 345E | 45.5 |
| AB | |
| **354** | 50 |
| 348 | 55 |
| 330 | 60 |
| AB + $AB_4$ | |
| 304E | 62 |
| $AB_4$ + B | |
| 324U | 68.5 |
| B | |
| 440 | 70 |
| 600 | 80 |
| 675 | 90 |
| **735** | 100 |

## $CdI_2$

B = CuI (110)

| $t$, °C | M % A | |
|---|---|---|
| $Mix_1$ | | |
| **606** | 0 | 0 |
| 570 | 4 | 10 |
| 475 | 24 | 35 |
| 413 | 47 | 55 |
| $Mix_1$ + $Mix_2$ | | |
| 350 | 81.5 | 81.5 |
| $Mix_2$ | | |
| 363 | 95 | 90 |
| **392** | 100 | 100 |

### $CdI_2$.—(*Continued*)

B = CuI.—(*Continued*)

| $t$, °C | M % A |
|---|---|
| Solid state | |
| B($\alpha$) + B($\beta$) | |
| 414 | 0 |
| 385 | 10 |
| 290 | 35 |
| 270 | 55 |
| 265 | 80 |

B = $HgI_2$ (229)

| $t$, °C | M % B |
|---|---|
| Mix. | |
| **380** | 0 |
| 365 | 10 |
| 348 | 20 |
| 335 | 30 |
| 323 | 40 |
| 315 | 50 |
| 309 | 60 |
| 300 | 70 |
| 290 | 80 |
| 273 | 90 |
| **253** | 100 |
| Solid state | |
| B($\alpha$) + B($\beta$) | |
| 105 | 70 |
| 118 | 80 |
| 125 | 90 |
| 128 | 100 |

B = NaI (43)

| A | |
|---|---|
| **385** | 0 |
| 375 | 10 |
| 357 | 20 |
| 335 | 30 |
| 308 | 40 |
| A + B | |
| 287E | 48 |
| B | |
| 308 | 50 |
| 417 | 60 |
| 505 | 70 |
| 570 | 80 |
| 620 | 90 |
| **653** | 100 |

B = KI (43)

| A | |
|---|---|
| **385** | 0 |
| 370 | 10 |
| 350 | 20 |
| 323 | 30 |
| 280 | 40 |
| A + $AB_2(\beta)$ | |
| 185E | 48 |
| $AB_2(\beta)$ | |
| 205 | 50 |
| $AB_2(\beta)$ + $AB_2(\alpha)$ | |
| 214 | 51 |
| $AB_2(\alpha)$ + B | |
| 270U | 58.5 |

B = KI.—(*Cont'd*)

| $t$, °C | M % B |
|---|---|
| B | |
| 300 | 60 |
| 450 | 70 |
| 555 | 80 |
| 630 | 90 |
| **678** | 100 |

### $CdSO_4$

B = $Li_2SO_4$ (54)

| $t$, °C | M % A |
|---|---|
| B($\alpha$) | |
| **856** | 0 |
| 768 | 10 |
| 663 | 20 |
| B($\alpha$) + B($\beta$) | |
| 570 | 28 |
| B($\beta$) + A | |
| 551E | 31.5 |
| A* | |
| 595 | 40 |
| 665 | 50 |
| 750 | 60 |
| 860 | 75 |
| **1000** | 100 |
| Solid state | |
| B($\alpha$) + B($\beta$) | |
| 585 | 0 |
| 570 | 5–28 |

* At 820° probable transition A($\alpha$) ⟶ A($\beta$).

B = $Na_2SO_4$ (54)

| Mix. | | |
|---|---|---|
| **1066** | 0 | 0 |
| 1050 | (6) | 10 |
| 960 | (13) | 20 |
| 860 | (22) | 30 |
| 730 | (31) | 40 |
| Mix. + $BA_2$ | | |
| 653E | 35 | 45.5 |
| $BA_2$ | | |
| 673 | 50 | |
| 745 | 60 | |
| $BA_2$ + $BA_3$ | | |
| 763U | 62.5 | |
| $BA_3$ | | |
| 778 | 65 | |
| 798 | 70 | |
| $BA_3$ + A | | |
| 813UE | 75 | |
| A* | | |
| 840 | 80 | |
| 945 | 90 | |
| **1000** | 100 | |
| Solid state | | |
| B($\alpha$) + B($\beta$) | | |
| 590 | 0 | |
| 523 | 9–66 | |
| Mix. + $BA_2$ | | |
| 600 | 27 | |
| 550 | 18 | |

* A($\alpha$) ⟶ A($\beta$) probable at 820°.

B = $K_2SO_4$ (54)

*v.* Fig. 22

### HgCl*

B = $HgCl_2$ (30) (A.)

| $t$, °C | M % A |
|---|---|
| B | |
| **265.0** | 0 |
| 264.2 | 0.62 |
| 263.8 | 0.96 |
| 263.4 | 1.22 |

* 2HgCl ⇄ $Hg_2Cl_2$ in solution in B.

### $HgCl_2$

B = $HgBr_2$ (170)

| $t$, °C | M % B |
|---|---|
| Mix. + liq. | |
| **265** | 0 |
| 248 | 10 |
| 235 | 20 |
| 226 | 30 |
| 220 | 40 |
| 216 | 50 |
| 213 | 60 |
| 212 | 70 |
| 215 | 80 |
| 219 | 90 |
| **222** | 100 |

B = $HgI_2$ (184)

*v.* Fig. 23

B = CuCl (30) (A.)

| A | |
|---|---|
| **265.0** | 0 |
| 264.3 | 0.59 |
| 263.8 | 1.16 |
| 263.3 | 2.06 |

B = AgI (33) (A.)

B = $AlCl_3$ (130) (A.)

| M. c. t. | |
|---|---|
| $t$, °C | M % A |
| B | |
| **190.2** | 0 |
| 189.7 | 7.7 |
| 189.0 | 18.5 |
| 184.6 | 26.4 |
| 167.5 | 37.4 |
| 157.4 | 41.4 |
| A | |
| 151.3 | 48.2 |
| 192.0 | 55.9 |
| 216.2 | 63.2 |
| 238.1 | 70.9 |
| 259.7 | 82.6 |
| 272.1 | 90.0 |

B = NaCl (30) (A.)

| $t$, °C | M % B |
|---|---|
| A | |
| **265.0** | 0 |
| 264.4 | 0.43 |
| 264.1 | 0.62 |
| 263.8 | 0.85 |

$k_A$ = 34.5 (0.03).

B = KCl (30) (A.)

| $t$, °C | M % B |
|---|---|
| A | |
| **265.0** | 0 |
| 264.5 | 0.40 |
| 264.3 | 0.58 |
| 263.8 | 1.04 |

$k_A$ = 32.4 (0.04).

B = RbCl (30) (A.)

| A | |
|---|---|
| **265.0** | 0 |
| 263.2 | 1.24 |
| 262.4 | 1.86 |
| 261.6 | 2.54 |

$k_A$ = 36.2 (1.0).

B = CsCl (30) (A.)

| A | |
|---|---|
| **265.0** | 0 |
| 263.6 | 0.99 |
| 263.0 | 1.43 |
| 262.5 | 1.79 |

$k_A$ = 36.8 (0.07).

### HgBr*

B = $HgBr_2$ (30, 98) (A.)

| $t$, °C | M % A |
|---|---|
| B | |
| **235.0** | 0 |
| 234.2 | 0.70 |
| 233.3 | 1.54 |
| 232.9 | 1.94 |

B = $AlBr_3$ (130) (A.)

| B | |
|---|---|
| **97.1** | 0 |
| 96.6 | 0.6 |
| BA | |
| 161.5 | 1.2 |
| 225.4 | 1.7 |
| 238.1 | 1.8† |
| 238.1 | 30.8 |
| 242.1 | 33.9 |
| 250.1 | 40.5 |
| 259.7 | 48.6 |
| **261.0** | 50.0 |
| 256.6 | 53.2 |
| 252.9 | 54.7 |
| 241.4 | 59.6 |
| A | |
| 243.7 | 62.7 |
| 281.3 | 66.1 |

* 2HgBr ⇄ $Hg_2Br_2$ in solution in B.

† Two liq. layers from 1.8 to 30.8.

### $HgBr_2$

B = $HgI_2$ (170, 214)

| $t$, °C | M % B |
|---|---|
| Mix$_1$ | |
| **236.5** | 0 \| 0 |
| 229 | (7) \| 10 |
| 222 | (15) \| 20 |
| 218 | (25) \| 30 |

B = $HgI_2$.—(*Cont'd*)

| $t$, °C | M % B |
|---|---|
| Mix$_1$ + Mix$_2$ | |
| 216.1 | 40 \| 40 |
| Mix$_2$ | |
| 217 | (55) \| 50 |
| 221 | (66) \| 60 |
| 227 | (75) \| 70 |
| 235 | (83) \| 80 |
| 245 | (92) \| 90 |
| **254.4** | 100 \| 100 |
| Solid state | |
| B($\alpha$) + B($\beta$) | |
| 50 | 70–(83) |
| 80 | 81–(89) |
| 100 | 88–(93) |
| 127 | 100 |

B = $AlBr_3$ (118)

| $t$, °C | M % A |
|---|---|
| B | |
| **97.4** | 0 |
| B + $B_2A$ | |
| (93)E | (7) |
| $B_2A$ | |
| 96.5 | 14.9 |
| 100.3 | 24.0 |
| **102.8** | 33.3 |
| $B_2A$ + A | |
| 100.5E | 38.2 |
| A | |
| 142.2 | 50.8 |
| 184.0 | 63.6 |
| 209.4 | 76.7 |
| 227.3 | 90.7 |
| **241.6** | 100 |

B = AgBr (98) (A.)

| $t$, °C | M % B |
|---|---|
| A | |
| **235.0** | 0 |
| 233.3 | 2.13 |
| 230.6 | 4.44 |
| 226.4 | 8.56 |

$k_A$ = 32.0 (0).

B = $AlBr_3$ (130) (A.)

| M. c. t. | | |
|---|---|---|
| $t$, °C | M % A | |
| B | | |
| **97.1** | 0 | |
| 95.8 | 1.4 | |
| $B_2A(\alpha)$ | ($\beta$)† | |
| ($\alpha$)* | | |
| 94.3 | | 3.8 |
| | 93.5 | 4.6 |
| 95.9 | 94.7 | 7.1 |
| 100.1 | 99.1 | 17.9 |
| 102.8 | 101.9 | 25.8 |
| 103.6 | 102.5 | 28.7 |
| | 102.6 | 32.2 |
| 103.9 | | 32.8 |
| **103.9** | **102.8** | 33.3 |
| 103.1 | | 37.7 |
| 101.9 | 100.7 | 40.3 |
| A | | |
| 118.8 | | 44.2 |
| 123.2 | | 45.2 |
| 145.5 | | 49.4 |

B = $AlBr_3$.—(*Continued*)

| $t$, °C | M % A |
|---|---|
| A | |
| 175.0 | 59.6 |
| 206.8 | 75.7 |
| 224.4 | 88.0 |
| 239.1 | 98.1 |
| **241.5** | 100 |

* Stable form.

† Metastable form.

B = KBr (98) (A.)

| $t$, °C | M % B |
|---|---|
| A | |
| **235.0** | 0 |
| 232.4 | 2.82 |
| 229.8 | 5.44 |
| 228.0 | 7.29 |

$k_A$ = 32.2 (0.22).

### HgI

B = $HgI_2$ (30, 31, 98) (A.)

| $t$, °C | M % A |
|---|---|
| B | |
| **250.0** | 0 |
| 246.3 | 3.11 |
| 242.6 | 6.04 |

$k_B$ = 54.0 (0).

### $HgI_2$

B = AgI (246)

| $t$, °C | M % B | |
|---|---|---|
| Mix$_1$ | | |
| **257** | 0 | 0 |
| 248 | 2.5 | 10 |
| Mix$_1$ + Mix$_2$ | | |
| 242E | 7 | 13 |
| | 19 | 13 |
| Mix$_2$ | | |
| 263 | 29 | 20 |
| 299 | 45 | 30 |
| 330 | 56 | 40 |
| 360 | 66.5 | 50 |
| 394 | 75 | 60 |
| 425 | 82 | 70 |
| 458 | 89 | 80 |
| 490 | 94.5 | 90 |
| **526** | 100 | 100 |

B = AgI (97) (A.)

| A | |
|---|---|
| **250.0** | 0 |
| 246.4 | 2.02 |
| 243.2 | 6.23 |
| 238.5 | 10.94 |

$k_A$ = 53.0 (0).

B = KI (97) (A.)

| A | |
|---|---|
| **250.0** | 0 |
| 247.2 | 2.13 |
| 246.9 | 4.06 |
| 242.8 | 5.53 |
| 237.7 | 7.20 |

$k_A$ = 53.5 (0).

### CuO

B = CuCl (256)

| t, °C | M % A |
|---|---|
| A | |
| **424** | 0 |
| A + B | |
| 424E | <1 |
| B | |
| 625 | 20 |
| 715 | 30 |
| 800 | 40 |
| 1055 | 75 |
| **1230** | 100 |

### CuCl

B = $CuCl_2$ (225)

| t, °C | M % B | |
|---|---|---|
| Mix. | | |
| **422** | 0 | 0 |
| 413 | 2 | 5 |
| 398 | 3 | 10 |
| Mix. + B | | |
| 378E | 4 | 13 |
| B | | |
| 402 | | 15 |
| 432 | | 20 |
| 465 | | 33 |

Above 465° B decomposes.

B = CuBr (162)

| | | |
|---|---|---|
| Mix. | | |
| **419** | | 0 |
| 411 | | 10 |
| 408 | | 20 |
| 408 | | 30 |
| 410 | | 40 |
| 417 | | 50 |
| 425 | | 60 |
| 437 | | 70 |
| 450 | | 80 |
| 465 | | 90 |
| **480** | | 100 |
| Solid state | | |
| A(α) + A(β) | | |
| 372 | | 70 |
| 377 | | 80 |
| 380 | | 90 |
| 384 | | 100 |

B = CuI (162)

| | |
|---|---|
| A | |
| **419** | 0 |
| 385 | 10 |
| 352 | 20 |
| 320 | 30 |
| 292 | 40 |
| A + Mix. | |
| 284E | 86 \| 43 |
| Mix. | |
| 320 | 88 \| 50 |
| 375 | 90 \| 60 |
| 428 | 93 \| 70 |
| 482 | 95 \| 80 |
| 535 | 98 \| 90 |
| **590** | 100 \| 100 |

B = CuI.—(*Cont'd*)

| t, °C | M % B |
|---|---|
| Solid state | |
| B(α) + B(β) | |
| 214 | 0–92 |
| 400 | 100 |

B = $Cu_2S$ (256)

| | |
|---|---|
| A | |
| **423** | 0 |
| 410 | 10 |
| A + B | |
| 391E | 17 |
| B | |
| 539 | 30 |
| 638 | 40 |
| 815 | 60 |
| 895 | 70 |
| 972 | 80 |
| 1048 | 90 |
| **1114** | 100 |

B = AgCl (229)

| t, °C | M % A | |
|---|---|---|
| $Mix_1$ | | |
| **455** | 0 | 0 |
| 425 | (3) | 10 |
| 392 | (5) | 20 |
| 355 | (7) | 30 |
| 318 | (9) | 40 |
| 279 | (10) | 50 |
| $Mix_1$ + $Mix_2$ | | |
| 260E | (10) | 54.5 |
| | 90 | 54.5 |
| $Mix_2$ | | |
| 282 | 91 | 60 |
| 320 | 92 | 70 |
| 355 | 94 | 80 |
| 388 | 96.5 | 90 |
| **422** | 100 | 100 |

B = $FeCl_3$ (110)

| t, °C | M % B |
|---|---|
| A | |
| **424** | 0 |
| 390 | 10 |
| 361 | 20 |
| 332 | 30 |
| A + AB | |
| 304E | 40 |
| AB | |
| **320** | 50 |
| 318 | 60 |
| 305 | 70 |
| 285 | 80 |
| AB + B | |
| 263E | 88 |
| B | |
| **298** | 100 |

B = $AlCl_3$ (130) (A.)

M. c. t.

| t, °C | M % A |
|---|---|
| B | |
| **190.2** | 0 |
| 190.0 | 10.5 |
| 187.4 | 19.7 |
| 175.3 | 30.8 |

B = $AlCl_3$.—(*Continued*)

| t, °C | M % A |
|---|---|
| BA | |
| 178.3 | 32.2 |
| 209.9 | 40.6 |
| 231.9 | 48.1 |
| **233.0** | 50.0 |
| 231.9 | 50.9 |
| 225.9 | 54.0 |
| A | |
| 227.4 | 57.4 |
| 252.5 | 60.1 |
| 291.5 | 62.0 |

B = $MgCl_2$ (159)

| | |
|---|---|
| B | |
| **711** | 0 |
| 701 | 5 |
| 658 | 30 |
| 618 | 50 |
| 567 | 70 |
| 493 | 90 |
| B + A | |
| 408E | 99 |
| A | |
| **418** | 100 |

B = $CaCl_2$ (159)

| | |
|---|---|
| B | |
| **777** | 0 |
| 750 | 10 |
| 720 | 30 |
| 690 | 50 |
| 635 | 70 |
| B + A | |
| 400E | 90 |
| A | |
| **418** | 100 |

B = LiCl (137, 229)

| t, °C | M % A | |
|---|---|---|
| $Mix_1$ | | |
| **602** | 0 | 0 |
| 574 | 7 | 10 |
| 546 | 13 | 20 |
| 513 | 19 | 30 |
| 480 | 24 | 40 |
| 438 | 26 | 55 |
| $Mix_1$ + $Mix_2$ | | |
| 424U | 27 | 62 |
| | 50 | 62 |
| $Mix_2$ | | |
| 415 | 59 | 70 |
| 408 | | 80 |
| 412 | | 90 |
| **422** | 100 | 100 |

B = NaCl (61, 137, 202, 229)

| | | |
|---|---|---|
| $Mix_1$ | | |
| **806** | 0 | 0 |
| 772 | (2) | 10 |
| 727 | (4) | 20 |
| 673 | (6) | 30 |
| 610 | (9) | 40 |
| 540 | (11) | 50 |
| 460 | (13) | 60 |
| 370 | (14) | 70 |

B = NaCl.—(*Continued*)

| t, °C | M % A |
|---|---|
| $Mix_1$ + $Mix_2$ | |
| 316E | 15 \| 75 |
| | 88 \| 75 |
| $Mix_2$ | |
| 335 | (90) \| 80 |
| 378 | (95) \| 90 |
| **422** | 100 \| 100 |

$k_B$ = 20.8 (1.0) (187) (A.).

B = KCl (61, 137, 202, 229)

| | |
|---|---|
| B | |
| **776** | 0 |
| 733 | 10 |
| 671 | 20 |
| 583 | 30 |
| 480 | 40 |
| 335 | 50 |
| B + $B_2A$ | |
| 224U | 53 |
| $B_2A$ | |
| 204 | 60 |
| $B_2A$ + A | |
| 136E | 68 |
| A | |
| 167 | 70 |
| 280 | 80 |
| 360 | 90 |
| **422** | 100 |

$k_B$ = 28.9 (1.1) (187) (A.).

B = RbCl (229)

| | |
|---|---|
| B | |
| **716** | 0 |
| 663 | 10 |
| 605 | 20 |
| 515 | 30 |
| 410 | 40 |
| 275 | 50 |
| B + $B_2A(\alpha)$ | |
| 250U | 51.5 |
| $B_2A(\alpha)$ + $B_2A_3$ | |
| 180UE | 60 |
| $B_2A_3$ + A | |
| 148E | 68 |
| A | |
| 175 | 70 |
| 285 | 80 |
| 368 | 90 |
| **422** | 100 |
| Solid state | |
| $B_2A(\alpha)$ + $B_2A(\beta)$ | |
| 105 | 20–45 |

B = CsCl (229)

| | |
|---|---|
| B(α) | |
| **639** | 0 |
| 597 | 10 |
| 540 | 20 |
| B(α) + B(β) | |
| 450 | 27 |
| B(β) | |
| 430 | 30 |
| 350 | 40 |

B = CsCl.—(*Continued*)

| t, °C | M % A |
|---|---|
| B(β) + $B_3A_2$ | |
| 320U | 43 |
| $B_3A_2$ | |
| 276 | 50 |
| $B_3A_2$ + $BA_2$ | |
| 236E | 54.5 |
| $BA_2$ | |
| 260 | 60 |
| **274** | 66.7 |
| 248 | 75 |
| $BA_2$ + A | |
| 216E | 77.5 |
| A | |
| 260 | 80 |
| 355 | 90 |
| **422** | 100 |

### CuBr

B = CuI (162)

| t, °C | M % B | |
|---|---|---|
| Mix. | | |
| **480** | 0 | |
| 460 | 10 | |
| 450 | 20 | |
| 442 | 30 | |
| 447 | 40 | |
| 460 | 50 | |
| 480 | 60 | |
| 502 | 70 | |
| 530 | 80 | |
| 560 | 90 | |
| **590** | 100 | |
| Solid state | | |
| B(α) + B(β) | | |
| 384 | 1 | |
| 375 | 10 | |
| 368 | 20 | |
| 363 | 30 | |
| 360 | 40 | |
| 357 | 50 | |
| 359 | 60 | |
| 363 | 70 | |
| 372 | 80 | |
| 383 | 90 | |
| 400 | 100 | |

B = KBr (62)

| | |
|---|---|
| A | |
| **478** | 0 |
| 423 | 10 |
| 338 | 20 |
| 210 | 30 |
| A + $AB_2$ | |
| 182E | 32 |
| $AB_2$ + B | |
| 234U | 36 |
| B | |
| 293 | 40 |
| 408 | 50 |
| 507 | 60 |
| 592 | 70 |
| 653 | 80 |
| 698 | 90 |
| **730** | 100 |

### CuI

B = AgI (209)

| t, °C | M % B | |
|---|---|---|
| $Mix_1$ | | |
| **602** | 0 | 0 |
| 563 | 6 | 10 |
| 536 | 13.5 | 20 |
| 515 | 22 | 30 |
| 500 | 32 | 40 |
| $Mix_1$ + $Mix_2$ | | |
| 490E | 50 | 50 |
| $Mix_2$ | | |
| 495 | 70 | 60 |
| 505 | 80 | 70 |
| 517 | 86 | 80 |
| 535 | 94 | 90 |
| **557** | 100 | 100 |
| Solid state | | |
| Unmixing | | |
| 402 | 0 | 0 |
| 372 | 5.5 | 10 |
| 349 | 12 | 20 |
| 333 | 20 | 30 |
| 317 | 29 | 40 |
| 298 | | 50 |
| 282 | | 60 |
| 268 | | 70 |
| 243 | | 80 |
| 205 | | 90 |
| 147 | 100 | |

### $Cu_2S$

B = $Ag_2S$ (80)

| t, °C | Wt. % A |
|---|---|
| Mix. + liq. | |
| **835** | 0 |
| 750 | 10 |
| 700 | 20 |
| 677 | 30 |
| 688 | 40 |
| 724 | 50 |
| 792 | 60 |
| 875 | 70 |
| 963 | 80 |
| 1045 | 90 |
| **1121** | 100 |

B = $Ni_2S$ (84)

| t, °C | Wt. % B |
|---|---|
| A | |
| **1125** | 0 |
| 1050 | 10 |
| 1000 | 20 |
| 975 | 30 |
| 965 | 40 |
| 935 | 50 |
| 890 | 60 |
| 810 | 70 |
| 720 | 80 |
| 610 | 90 |
| A + B | |
| 575E | 92.5 |
| B | |
| 610 | 95 |
| **645** | 100 |

### $Cu_2S$.—
(*Continued*)

B = $Ni_2S$.—
(*Continued*)

| *t*, °C | Wt. % B |
|---|---|
| Solid state | |
| B(α) + B(β) | |
| 530 | 0–100 |

B = $Ni_3S_2$ (84, 108)

| | |
|---|---|
| A | |
| **1125** | 0 |
| 1055 | 10 |
| 995 | 20 |
| 960 | 30 |
| 935 | 40 |
| 915 | 50 |
| 880 | 60 |
| 835 | 70 |
| 785 | 80 |
| A + B | |
| 725E | 90 |
| B | |
| 760 | 95 |
| **790** | 100 |
| Solid state | |
| B(α) + B(β) | |
| 545 | 0–100 |

B = $Na_2S$ (84)

| *t*, °C | M % A |
|---|---|
| B | |
| **920** | 0 |
| 770 | 10 |
| 655 | 20 |
| 555 | 30 |
| B + AB | |
| 505E | 35 |
| AB | |
| 620 | 40 |
| **700** | 50 |
| 675 | 55 |
| AB + A | |
| 595E | 59 |
| A | |
| 660 | 70 |
| 775 | 80 |
| **1125** | 100 |

### $Cu_2(CN)_2$

B = NaCN (256)

| *t*, °C | M % B |
|---|---|
| A | |
| **473** | 0 |
| 402 | 30 |
| 352 | 40 |
| A + $AB_2$ | |
| 345E | 41.5 |
| $AB_2$ | |
| 370 | 50 |
| **390** | 60 |
| **398** | 66.7 |
| 387 | 70 |
| $AB_2$ + $AB_4$ | |
| 368E | 75.5 |
| $AB_4$ + $AB_6$ | |
| 372UE | 80 |
| $AB_6$ + Mix. | |
| 406UE | 85.7 |

B = NaCN.—
(*Continued*)

| *t*, °C | M % B | |
|---|---|---|
| Mix. | | |
| 476 | 95 | 90 |
| 520 | 98 | 95 |
| **562** | 100 | 100 |

$AB_3$ forms at 318° in range, 66.7–80 M %.

B = KCN (256)

| | |
|---|---|
| A | |
| **473** | 0 |
| 440 | 15 |
| 306 | 35 |
| A + AB | |
| 280E | 39.5 |
| AB | |
| **327** | 50 |
| AB + $AB_2$ | |
| 324E | 56 |
| $AB_2$ | |
| **327** | 66.7 |
| 312 | 70 |
| $AB_2$ + $AB_6$ | |
| 277E | 74 |
| $AB_6$ | |
| 384 | 80 |
| $AB_6$ + B | |
| 398UE | 85.7 |
| B | |
| 500 | 90 |
| **622** | 100 |
| Solid state | |

$A_3B_2$ forms at 230° over M = 0–50.

$AB_3$ forms at 228° over M = 66.7–85.7.

### AgCl

B = AgBr (162)

| | |
|---|---|
| Mix. + liq. | |
| **452** | 0 |
| 443 | 10 |
| 434 | 20 |
| 427 | 30 |
| 420 | 40 |
| 416 | 50 |
| 413 | 60 |
| 412 | 65 |
| 413 | 70 |
| 415 | 80 |
| 418 | 90 |
| **422** | 100 |

B = AgI (162)

| | |
|---|---|
| A | |
| **452** | 0 |
| 418 | 10 |
| 380 | 20 |
| 340 | 30 |
| 295 | 40 |
| 245 | 50 |
| A + Mix. | |
| 211E | 56.1 |
| Mix. | |
| 250 | (88) 60 |
| **350** | (91) 70 |

B = AgI.—
(*Continued*)

| *t*, °C | M % B | |
|---|---|---|
| Mix. | | |
| 435 | (94) | 80 |
| 495 | (97) | 90 |
| **552** | 100 | 100 |
| Solid state | | |
| B(α) + B(β) | | |
| 115 | 0–88 | |
| 125 | 92–94 | |
| 143 | 100 | |

B = $Ag_2S$ (226, 256)

| | |
|---|---|
| A | |
| **456** | 0 |
| 427 | 10 |
| 403 | 20 |
| 388 | 30 |
| A + B(α) | |
| 380E | 35.3 |
| B(α) | |
| 404 | 40 |
| 480 | 50 |
| 565 | 60 |
| 635 | 70 |
| 695 | 80 |
| 750 | 90 |
| **836** | 100 |
| Solid state | |
| B(α) + B(β) | |
| 178 | 100 |

B = $AgNO_3$ (126, 234)

| | |
|---|---|
| A | |
| **454** | 0 |
| 426 | 10 |
| 395 | 20 |
| 358 | 30 |
| 319 | 40 |
| 278 | 50 |
| 235 | 60 |
| 190 | 70 |
| A + Mix. | |
| 160E | 76.7 |
| Mix. | |
| 170 | 95 80 |
| 195 | 98 90 |
| **210** | 100 100 |
| Solid state | |
| B(α) + B(β) | |
| 85 | 0–93 |
| 105 | 95–97 |
| 155 | 100 |

$k_B$ = 26.5 (1.0) (109) (A.).

B = $AlCl_3$ (130) (A.)

| *t*, °C | M % A |
|---|---|
| B | |
| **190.2** | 0 |
| $B_xA$ | |
| 191.2 | 0.4 |
| 192.9 | 0.7* |
| 192.9 | 17.6 |
| 190.1 | 20.1 |
| 184.5 | 26.5 |
| 156.0 | 33.4 |

B = $AlCl_3$.—
(*Continued*)

| *t*, °C | M % A |
|---|---|
| $B_xA$ | |
| 136.8 | 38.0 |
| 121.9 | 39.7 |
| BA | |
| 122.2 | 39.9 |
| 138.9 | 43.6 |
| 147.5 | 47.0 |
| A | |
| 175.4 | 47.9 |
| 285.3 | 49.1 |
| 378.0 | 50.8 |

* Two liq. layers from 0.7 to 17.6.

B = $BeCl_2$ (280)

B = $MgCl_2$ (144)

| | |
|---|---|
| B | |
| **711** | 0 |
| 688 | 10 |
| 665 | 20 |
| 642 | 30 |
| 616 | 40 |
| 589 | 50 |
| 558 | 60 |
| 524 | 70 |
| 486 | 80 |
| B + A | |
| 452E | 87.5 |
| A | |
| **455** | 100 |

B = $CaCl_2$ (144)

| | |
|---|---|
| B | |
| **777** | 0 |
| 732 | 10 |
| 700 | 20 |
| 680 | 30 |
| 668 | 40 |
| 650 | 50 |
| 618 | 60 |
| 563 | 70 |
| 470 | 80 |
| B + A | |
| 450E | 81.3 |
| A | |
| 453 | 90 |
| **455** | 100 |

B = LiCl (229)

| | | |
|---|---|---|
| $Mix_1$ | | |
| **602** | 0 | 0 |
| 581 | 4.7 | 10 |
| 561 | 8 | 20 |
| 542 | 10.5 | 30 |
| 525 | 12.5 | 40 |
| 509 | 14.5 | 50 |
| 493 | 16 | 60 |
| 474 | 17 | 70 |
| $Mix_1$ + $Mix_2$ | | |
| 469U | 18 | 72 |
| | 50 | 72 |
| $Mix_2$ | | |
| 466 | 54 | 75 |
| 463 | 60 | 80 |
| 458 | 72 | 90 |
| **455** | 100 | 100 |

B = NaCl (39, 229, 279)

| *t*, °C | M % A |
|---|---|
| Mix. | |
| **806** | 0 0 |
| 775 | 4.6 10 |
| 743 | 10 20 |
| 710 | 15.3 30 |
| 675 | 21.5 40 |
| 637 | 28.5 50 |
| 598 | 36 60 |
| 561 | 43.5 70 |
| 524 | 52 80 |
| 488 | 62 90 |
| 472 | 73 95 |
| **455** | 100 100 |

B = KCl (277)

| *t*, °C | M % B |
|---|---|
| A | |
| **451** | 0 |
| 408 | 10 |
| 361 | 20 |
| 335 | 25 |
| A + B | |
| 306E | 30.5 |
| B | |
| 405 | 40 |
| 490 | 50 |
| 560 | 60 |
| 622 | 70 |
| 679 | 80 |
| 735 | 90 |
| **790** | 100 |

$k_B$ = 27.7 (0.63) (187) (A.).

B = RbCl (229)

| *t*, °C | M % A |
|---|---|
| B | |
| **715** | 0 |
| 680 | 10 |
| 630 | 20 |
| 560 | 30 |
| 475 | 40 |
| 370 | 50 |
| B + A | |
| 253E | 60 |
| A | |
| 325 | 70 |
| 375 | 80 |
| 415 | 90 |
| **455** | 100 |

B = CsCl (229)

| | |
|---|---|
| B(α) | |
| **639** | 0 |
| 603 | 10 |
| 550 | 20 |
| 473 | 30 |
| B(α) + B(β) | |
| 450U | 32 |
| B(β) | |
| 400 | 40 |
| 320 | 50 |
| B(β) + AB | |
| 310U | 51 |

B = CsCl.—
(*Continued*)

| *t*, °C | M % A |
|---|---|
| AB | |
| 298 | 60 |
| 267 | 70 |
| AB + A | |
| 258E | 72 |
| A | |
| 355 | 80 |
| 413 | 90 |
| **455** | 100 |

### $AgClO_3$

B = $NaClO_3$ (78) (A.)

| | |
|---|---|
| Mix. (?) | |
| **255.0** | 0 |
| 254.1 | 2.81 |
| 253.3 | 5.46 |
| 251.7 | 10.32 |
| 251.0 | 12.62 |

### AgBr

B = AgI (162)

| *t*, °C | M % B |
|---|---|
| Mix. + liq. | |
| **422** | 0 |
| 398 | 10 |
| 383 | 20 |
| 378 | 30 |
| 388 | 40 |
| 409 | 50 |
| 434 | 60 |
| 462 | 70 |
| 490 | 80 |
| 520 | 90 |
| **552** | 100 |
| Solid state | |
| B(α) + B(β) | |
| 96 | 70–(84) |
| 103 | 80–(87) |
| 116 | 90–(94) |
| 143 | 100 |

B = $AgNO_3$ (126, 234)

| | |
|---|---|
| A | |
| **420** | 0 |
| 380 | 10 |
| 340 | 20 |
| 300 | 30 |
| 257 | 40 |
| 211 | 50 |
| A + AB | |
| 188U | 54.5 |
| AB | |
| 186 | 60 |
| 171 | 70 |
| AB + Mix. | |
| 155E | 76 |
| Mix. | |
| 167 | 96 8 |
| 193 | 98 9 |
| **210** | 100 10 |

B = $AgNO_3$.—(*Continued*)

| $t$, °C | M % B |
|---|---|
| Solid state | |
| B($\alpha$) + B($\beta$) | |
| 80 | 50–96 |
| 115 | 98 |
| 155 | 100 |

$k_B$ = 27.3 (0.83) (109) (A.).

B = $AlBr_3$ (130) (A.)

M. c. t.

| $t$, °C | M % A |
|---|---|
| B | |
| **97.1** | 0 |
| 94.2 | 1.1 |
| 93.4 | 1.3 |
| $B_2A$ | |
| 95.3 | 1.5 |
| 98.2 | 1.6 |
| 105.9 | 2.2* |
| 105.9 | 17.0 |
| 108.6 | 18.7 |
| 111.3 | 20.7 |
| 115.6 | 25.6 |
| 117.8 | 27.8 |
| BA | |
| 125.2 | 30.2 |
| 154.6 | 35.6 |
| 182.3 | 40.9 |
| 206.8 | 46.8 |
| **215.6** | 50.0 |
| 210.3 | 52.0 |
| A | |
| 319.0 | 54.9 |

* Two liq. layers from 2.2 to 17.0.

B = LiBr (231)

| $t$, °C | M % A | |
|---|---|---|
| Mix. | | |
| **556** | 0 | 0 |
| 520 | 9 | 14 |
| 490 | 18.5 | 27.5 |
| 470 | 27.3 | 40 |
| 460 | 33 | 49 |
| 450 | 40 | 59 |
| 440 | 49 | 71 |
| 430 | 62 | 83.5 |
| 420 | 90 | 99 |
| **419** | 100 | 100 |

B = NaBr (231, 279)

| | | |
|---|---|---|
| Mix. | | |
| **748** | 0 | 0 |
| 713 | (2) | 10 |
| 673 | (6) | 20 |
| 633 | (10) | 30 |
| 598 | (15) | 40 |
| 560 | (19) | 50 |
| 518 | (26) | 60 |
| 479 | (34) | 70 |
| 443 | 48 | 80 |
| 425 | 68 | 87 |
| **419** | 100 | 100 |

B = KBr (231, 279)

| $t$, °C | M % A |
|---|---|
| B | |
| **742** | 0 |
| 692 | 10 |
| 633 | 20 |
| 567 | 30 |
| 485 | 40 |
| 367 | 50 |
| B + A | |
| 290E | 55.5 |
| A | |
| 302 | 60 |
| 328 | 70 |
| 357 | 80 |
| 388 | 90 |
| **419** | 100 |

B = RbBr (231)

| | |
|---|---|
| B | |
| **670** | 0 |
| 645 | 10 |
| 598 | 20 |
| 536 | 30 |
| 452 | 40 |
| 335 | 50 |
| B + $AB_2$ (?) | |
| 270U | 54.2 |
| $AB_2$ (?) | |
| 255 | 60 |
| $AB_2$ (?) + A | |
| 228E | 68 |
| A | |
| 245 | 70 |
| 320 | 80 |
| 375 | 90 |
| **419** | 100 |

## AgI

B = $AgNO_3$ (234)

*v. also* Fig. 24

| $t$, °C | M % B | |
|---|---|---|
| A($\alpha$) | | |
| **548** | 0 | |
| $Mix_1$ | | |
| 470 | (2) | 10 |
| 370 | (3) | 20 |
| 260 | (4) | 30 |
| 135 | (5) | 40 |

B = LiI (231)

| $t$, °C | M % A |
|---|---|
| Mix. + liq. | |
| **450** | 0 |
| 430 | 10 |
| 422 | 20 |
| 438 | 30 |
| 462 | 40 |
| 480 | 50 |
| 497 | 60 |
| 512 | 70 |
| 525 | 80 |
| 537 | 90 |
| **546** | 100 |

B = LiI.—(*Cont'd*)

| $t$, °C | M % A |
|---|---|
| Solid state | |
| A($\alpha$) + A($\beta$) | |
| 418 | 20 |
| 403 | 30 |
| 380 | 40 |
| 350 | 50 |
| 315 | 60 |
| 277 | 70 |
| 237 | 80 |
| 194 | 90 |
| 145 | 100 |

B = NaI (231)

| | |
|---|---|
| B | |
| **662** | 0 |
| 640 | 10 |
| 598 | 20 |
| 558 | 30 |
| 515 | 40 |
| 471 | 50 |
| 421 | 60 |
| B + A($\alpha$) | |
| 390E | 65.5 |
| A($\alpha$) | |
| 402 | 70 |
| 430 | 80 |
| 488 | 90 |
| **546** | 100 |
| Solid state | |
| A($\alpha$) + A($\beta$) | |
| 145 | 0–100 |

B = KI (228)

| | |
|---|---|
| B | |
| **680** | 0 |
| 648 | 10 |
| 602 | 20 |
| 540 | 30 |
| 463 | 40 |
| 373 | 50 |
| 265 | 60 |
| B + $A_2B$ (?) | |
| 245E | 61.5 |
| $A_2B$ (?) + A($\alpha$) | |
| 255U | 62.5 |
| A($\alpha$) | |
| 328 | 70 |
| 393 | 80 |
| 460 | 90 |
| **546** | 100 |
| Solid state | |
| A($\alpha$) + A($\beta$) | |
| 142 | 67–100 |

B = RbI (228)

| | |
|---|---|
| B | |
| **638** | 0 |
| 594 | 10 |
| 543 | 20 |
| 487 | 30 |
| 423 | 40 |
| 323 | 50 |
| B + $B_2A$ | |
| 280U | 52 |
| $B_2A$ | |
| 262 | 60 |
| 224 | 70 |

B = RbI.—(*Continued*)

| $t$, °C | M % A |
|---|---|
| $B_2A$ + A($\alpha$) | |
| 195E | 75 |
| A($\alpha$) | |
| 283 | 80 |
| 430 | 90 |
| **546** | 100 |
| Solid state | |
| A($\alpha$) + A($\beta$) | |
| 142 | 34–100 |

## $Ag_2S$

B = $Ag_2Se$ (185)

| $t$, °C | Wt. % A | |
|---|---|---|
| Mix. | | |
| **855** | 0 | 0 |
| 851 | 2 | 10 |
| 845 | 5 | 20 |
| 837 | 10 | 30 |
| 827 | 15 | 40 |
| 813 | 21 | 50 |
| 794 | 32 | 70 |
| 771 | | 74 |
| 767 | 74 | |
| 780 | 92 | 80 |
| 802 | 97 | 90 |
| **839** | 100 | 100 |
| Solid state | | |
| A($\alpha$) + A($\beta$) | | |
| 177 | 100 | |
| 150 | 89 | |
| 120 | 75 | |
| 111 | 0 | 70 |
| 90 | 10 | 55 |
| 74 | 28 | |

B = FeS (242)

| $t$, °C | Wt. % B |
|---|---|
| A($\alpha$) | |
| **812** | 0 |
| 620 | 10 |
| A($\alpha$) + B | |
| 615 | 11 |
| B | |
| 735 | 20 |
| 825 | 30 |
| 910 | 40 |
| 885 | 50 |
| 1045 | 60 |
| 1090 | 70 |
| 1125 | 80 |
| 1155 | 90 |
| **1171** | 100 |
| Solid state | |
| A($\alpha$) + A($\beta$) | |
| 175 | 0–90 |

## $Ag_2SO_4$

B = $Li_2SO_4$ (166)

*v.* Fig. 25

B = $Na_2SO_4$ (166)

*v.* Fig. 26

B = $K_2SO_4$ (166)

*v.* Fig. 27

## $AgNO_3$

B = $NaNO_3$ (112)

| $t$, °C | M % B | |
|---|---|---|
| $Mix_1$ | | |
| **208.6** | 0 | 0 |
| 212 | (17) | 10 |
| $Mix_1$ + $Mix_2$ | | |
| 217U | 26 | 20 |
| | 40 | 20 |
| $Mix_2$ | | |
| 234 | 47 | 30 |
| 248 | 54 | 40 |
| 261 | 62 | 50 |
| 274 | 71.5 | 60 |
| 283 | 78 | 70 |
| 291 | 86 | 80 |
| 300 | 94 | 90 |
| **308** | 100 | 100 |
| Solid state | | |
| A($\alpha$) + A($\beta$) | | |
| 159 | 0 | |
| 138 | 5 | |
| 138 | 20 | |

B = KCl* (126) (A.)

| $t$, °C | M % A |
|---|---|
| A | |
| **207.2** | 0 |
| 201.9 | 1.82 |
| 194.0 | 3.83 |
| 164.0 | 10.26 |
| (?) | |
| 158.8 | 11.65 |
| 190.0 | 22.08 |
| 215.0 | 23.77 |
| >260 | 26.36 |

B = KBr* (126) (A.)

| $t$, °C | M % B |
|---|---|
| A | |
| **207.2** | 0 |
| 180.6 | 6.64 |
| 163.5 | 9.64 |
| 149.0 | 11.85 |
| (?) | |
| 141.7 | 12.86 |
| 148.0 | 14.79 |
| 160.6 | 16.13 |
| 190.0 | 22.08 |
| 215.0 | 23.17 |

B = KI* (126) (A.)

| $t$, °C | M % B |
|---|---|
| A | |
| **207.2** | 0 |
| 194.2 | 3.7 |
| 152.2 | 10.4 |
| (?) | |
| 118.0 | 14.0 |
| 171.0 | 17.4 |
| >215 | 26.7 |

* Reciprocal salt mixtures.

B = $KNO_3$ (258)

| $t$, °C | M % B |
|---|---|
| A($\alpha$) | |
| **209** | 0 |
| 192 | 10 |
| 172 | 20 |
| A($\beta$) | |
| 162 | 24 |

B = $KNO_3$.—(*Continued*)

| $t$, °C | M % B |
|---|---|
| A($\beta$) + AB | |
| 131E | 38 |
| AB | |
| 132 | 40 |
| AB + B($\alpha$) | |
| 134U | 45.5 |
| B($\alpha$) | |
| 158 | 50 |
| 202 | 60 |
| 242 | 70 |
| 277 | 80 |
| 310 | 90 |
| **339** | 100 |
| A + B | |
| 120Em | 41 |
| Solid state | |
| B($\alpha$) + B($\beta$) | |
| 125 | 50–100 |

## AgCN

B = NaCN (256)

| | |
|---|---|
| AB | |
| **471** | 50 |
| $Mix_1$ | |
| 455 | (51) 60 |
| 428 | (52) 70 |
| $Mix_1$ + $Mix_2$ | |
| 424E | (52) 71 |
| | 91 71 |
| $Mix_2$ | |
| 490 | 93.5 80 |
| 535 | 97 90 |
| **562** | 100 100 |

B = KCN (256)

| | |
|---|---|
| A + AB | |
| 291E | 11 |
| AB | |
| 318 | 20 |
| 340 | 30 |
| 357 | 40 |
| **370** | 50 |
| 320 | 60 |
| AB + B | |
| 291E | 65 |
| B | |
| 385 | 70 |
| 510 | 80 |
| 583 | 90 |
| **622.5** | 100 |

## $Ag_2Te$

B = $AuTe_2$ (207)

| | |
|---|---|
| A($\alpha$) | |
| **961** | 0 |
| 775 | 10 |
| 617 | 20 |
| A($\alpha$) + A($\beta$) | |
| 495 | 30 |
| A($\beta$) | |
| 400 | 40 |
| A($\beta$) + B | |
| 374E | 47.5 |

### $Ag_2Te$.—

(*Continued*)

B = $AuTe_2$.—

(*Continued*)

| *t*, °C | M % B |
|---|---|
| B | |
| 377 | 50 |
| 395 | 60 |
| 413 | 70 |
| 430 | 80 |
| 447 | 90 |
| **464** | 100 |

### MnO

B = $B_2O_3$ (156) (A.)

| | |
|---|---|
| (?) | |
| 800 | 40.34 |
| 760 | 44.35 |
| (?) + AB | |
| 750E | 46.30 |
| AB | |
| 770 | 47.36 |
| 840 | 50.30 |
| 820 | 53.35 |
| AB + $AB_2$ | |
| 800E | 55.35 |
| $AB_2$ | |
| 850 | 59.35 |
| 900 | 62.35 |
| 940 | 65.35 |
| 910 | 68.30 |
| $AB_2$ + $AB_3$ | |
| 860E | 71.30 |
| $AB_3$ | |
| 920 | 75.27 |
| 870 | 78.24 |

### $MnCl_2$

B = $AlCl_3$ (130) (A.)

M. c. t.

| *t*, °C | M % A |
|---|---|
| B | |
| **190.2** | 0 |
| 189.9 | 9.7 |
| 186.4 | 13.5 |
| 185.4 | 16.1 |
| $B_2A$ (?) | |
| 197.2 | 19.1 |
| 203.9 | 20.9 |
| 212.9 | 23.5 |
| 226.9 | 31.4 |
| A | |
| 271.1 | 32.4 |
| 308.8 | 34.9 |

B = $MgCl_2$ (229)

| Mix. + liq. | |
|---|---|
| **712** | 0 |
| 702 | 20 |
| 693 | 30 |
| 684 | 40 |
| 677 | 50 |
| 670 | 60 |
| 665 | 70 |
| 655 | 90 |
| **650** | 100 |

B = $CaCl_2$ (229)

| *t*, °C | M % A | |
|---|---|---|
| $Mix_1$ | | |
| **772** | 0 | 0 |
| 740 | (6) | 10 |
| 705 | (15) | 20 |
| 665 | (26) | 30 |
| 635 | (36) | 40 |
| 607 | 46 | 50 |
| 590 | 56 | 60 |
| $Mix_1$ + $Mix_2$ | | |
| 588 | 62.5 | 62.5 |
| $Mix_2$ | | |
| 593 | 75 | 70 |
| 615 | 87 | 80 |
| 637 | 96 | 90 |
| **650** | 100 | 100 |
| Solid state | | |
| Unmixing | | |
| 470 | 60 | |
| 450 | 50 | 67 |

B = $SrCl_2$ (229)

| B | |
|---|---|
| **872** | 0 |
| 800 | 10 |
| 720 | 20 |
| 635 | 30 |
| 545 | 40 |
| B + A | |
| 499E | 45 |
| A | |
| 510 | 50 |
| 530 | 60 |
| 555 | 70 |
| 593 | 80 |
| 625 | 90 |
| **650** | 100 |

B = $BaCl_2$ (229)

| B(α) | |
|---|---|
| **960** | 0 |
| B(α) + B(β) | |
| 923 | 6 |
| B(β) | |
| 905 | 10 |
| 842 | 20 |
| 765 | 30 |
| 670 | 40 |
| 560 | 50 |
| B(β) + $A_xB_y$ | |
| 535U | 51.5 |
| $A_xB_y$ | |
| 520 | 60 |
| $A_xB_y$ + A | |
| 504E | 63 |
| A | |
| 557 | 70 |
| 595 | 80 |
| 625 | 90 |
| **650** | 100 |

B = LiCl (230)

| *t*, °C | M % B | |
|---|---|---|
| $Mix_1$ | | |
| **650** | 0 | 0 |
| 634 | 3 | 10 |
| 612 | 8 | 20 |
| 583 | 17 | 30 |

B = LiCl.—

(*Continued*)

| *t*, °C | M % B | |
|---|---|---|
| $Mix_1$ + $Mix_2$ | | |
| 562 | 45 | 45 |
| $Mix_2$ | | |
| 575 | 79 | 60 |
| 590 | 92 | 80 |
| 596 | 96 | 90 |
| **602** | 100 | 100 |

B = NaCl (230)

| A | |
|---|---|
| **650** | 0 |
| 628 | 10 |
| 594 | 20 |
| 550 | 30 |
| 490 | 40 |
| A + $A_xB$ | |
| 442U | 46 |
| $A_xB$ + $AB_y$ | |
| 425E | 50 |
| $AB_y$ + B | |
| 446U | 58 |
| B | |
| 533 | 65 |
| 585 | 70 |
| 680 | 80 |
| 750 | 90 |
| **804** | 100 |

B = KCl (230)

| A | |
|---|---|
| **650** | 0 |
| 625 | 10 |
| 575 | 20 |
| 505 | 30 |
| A + AB | |
| 449E | 35 |
| AB | |
| 470 | 40 |
| **495** | 50 |
| 465 | 60 |
| AB + $AB_4$ | |
| 428E | 65 |
| $AB_4$ + B | |
| 445U | 69 |
| B | |
| 540 | 75 |
| 620 | 80 |
| 715 | 90 |
| **774** | 100 |

### $MnBr_2$

B = $AlBr_3$ (130) (A.)

M. c. t.

| *t*, °C | M % A |
|---|---|
| B | |
| **97.1** | 0 |
| 96.3 | 0.7 |
| $B_2A$ (?) | |
| 127.1 | 0.7 |
| 171.6 | 2.0 |
| 199.1 | 4.6 |
| 204.6 | 9.4 |
| 210.8 | 13.8 |
| 223.8 | 20.6 |
| 232.9 | 24.0 |

B = $AlBr_3$.—

(*Continued*)

| *t*, °C | M % A |
|---|---|
| $B_2A$ (?) | |
| 241.7 | 28.0 |
| 242.6 | 29.6 |
| A | |
| >300 | 31.0 |

### MnS

B = $MnSiO_3$ (261)

| B | |
|---|---|
| **1216** | 0 |
| 1157 | 5 |
| B + A | |
| 1130E | 7 |
| A | |
| 1166 | 10 |
| 1549 | 40 |

### $MnSO_4$

B = $Na_2SO_4$ (55)

| Mix. + liq. | |
|---|---|
| **887** | 0 |
| 865 | 10 |
| 830 | 20 |
| 784 | 30 |
| 718 | 40 |
| 665 | 50 |
| Mix. + $BA_3$ | |
| 645E | 54 |
| $BA_3$ | |
| 673 | 60 |
| 708 | 70 |
| **715** | 75 |
| 704 | 85 |
| 685 | 89* |
| Solid state | |
| Mix. + $BA_3$ | |
| 600 | 43.5 |
| 500 | 25.5 |
| 420 | 14 |
| Mix. + $B_3A$† | |
| 400 | 17.5 |
| 300 | 7.5 |
| 210 | 3.5 |
| B(α) + B(β) | |
| 235 | 0 |
| 210 | 3.5–75 |

B = $Li_2SO_4$ (55)

| B(α) | |
|---|---|
| **856** | 0 |
| 770 | 10 |
| 660 | 20 |
| B(α) + A | |
| 580E | 28 |
| A | |
| 610 | 40 |
| 628 | 50 |
| 640 | 60 |
| 658 | 80* |
| Solid state | |
| B(α) + B(β) | |
| 565 | 0–80 |

* Decompn. of A above 80 M %.

† Forms at 420° over range 14–75 M %.

B = $K_2SO_4$ (55)

| *t*, °C | M % A | |
|---|---|---|
| Mix. | | |
| **1066** | 0 | 0 |
| 1018 | (3) | 10 |
| 948 | (8) | 20 |
| 833 | (16) | 30 |
| Mix. + $A_2B$ | | |
| 680E | 23.5 | 40.5 |
| $A_2B$ | | |
| 765 | 50 | |
| 820 | 60 | |
| **842** | 66.7 | |
| 823 | 75 | |
| $A_2B$ + A | | |
| 800E | 82 | |
| A | | |
| 815 | 87* | |
| Solid state | | |
| B(α) + B(β) | | |
| 590 | 0 | |
| 560 | 5–66.7 | |
| Mix. + $A_2B$ | | |
| 650 | 19 | |
| 600 | 13.5 | |

* A decomposes above 85 M %.

### $MnSiO_3$

B = $MnTiO_3$ (245)

| *t*, °C | M % B | |
|---|---|---|
| A | | |
| **1218** | 0 | |
| 1208 | 10 | |
| 1153 | 20 | |
| A + Mix. | | |
| 1121E | 39 | 22.5 |
| Mix. | | |
| 1158 | 42 | 30 |
| 1199 | 52 | 40 |
| 1238 | 66 | 50 |
| 1273 | 74 | 60 |
| 1306 | 81 | 70 |
| 1337 | 88 | 80 |
| 1370 | 94 | 90 |
| **1404** | 100 | 100 |

There is a transformation at 1050–1060° over range 30–85 M %.

### $FeF_3$

B = NaF (205) (A.)

| *t*, °C | M % A |
|---|---|
| B | |
| **1040** | 0 |
| 1025 | 10 |
| 1005 | 15 |
| 975 | 25 |
| 945 | 30 |
| B + (?) | |
| 892E* | 35 |

* All mixtures give a halting pt. at 892°.

### $FeBr_2$

B = $AlBr_3$ (130) (A.)

20 M % A soluble in B at 300°.

### FeS

B = $Na_2S$ (252) (A.)

| *t*, °C | M % B |
|---|---|
| A | |
| 835 | 25.0 |
| 685 | 33.3 |
| A + (?) | |
| 661E | 50.0 |

Exptl. mixtures give a halting pt. at *ca.* 665°.

### $CoSO_4$

B = $Li_2SO_4$ (53)

| *t*, °C | M % A | |
|---|---|---|
| Mix. | | |
| **856** | 0 | 0 |
| 785 | (5) | 10 |
| 640 | (12) | 25 |
| Mix. + A | | |
| 595E | 14 | 29 |
| A* | | |
| 670 | 40 | |
| 757 | 50 | |
| 850 | 65 | |
| Solid state | | |
| B(α) + B(β) | | |
| 585 | 0 | |
| 577 | 5 | |
| 570 | 11–25 | |

* Decomposes above 70 M %.

B = $Na_2SO_4$ (53)

| Mix. | | |
|---|---|---|
| **887** | 0 | 0 |
| 850 | (5) | 10 |
| 797 | (11) | 20 |
| 720 | (18) | 30 |
| 622 | (27) | 40 |
| Mix. + A | | |
| 575E | 30 | 50 |
| A | | |
| 665 | 60 | |
| 790 | 70 | |
| 900* | 78.5 | |
| Solid state† | | |
| Mix. + A | | |
| 550 | 29 | |
| 500 | 26 | |
| 450 | 21 | |
| Mix. + $B_3A$ | | |
| 400 | 15 | |
| 350 | 5 | |
| 250 | 4 | |

* A decomposes above 900°.

† $B_3A$ forms at 425° and >18 M % A.

B = $K_2SO_4$ (53)

| $t$, °C | M % A |
|---|---|
| B(α) | |
| **1066** | 0 |
| 1015 | 10 |
| 935 | 20 |
| 800 | 30 |
| 605 | 40 |
| B + BA | |
| 535E | 42.5 |
| BA + $BA_2$ | |
| 560U | 48 |
| $BA_2$ | |
| 605 | 50 |
| 710 | 60 |
| **736** | 66.7 |
| $BA_2$ + A | |
| 725E | 70.5 |
| A* | |
| 825 | 77 |

* Decomposes above 80 M %.

## CoAs

B = NiAs (83)

| $t$, °C | Wt. % A |
|---|---|
| Mix. | |
| **970** | 0 |
| 995 | 10 |
| 1020 | 20 |
| 1045 | 30 |
| 1068 | 40 |
| 1090 | 50 |
| 1110 | 60 |
| 1130 | 70 |
| 1147 | 80 |
| 1163 | 90 |
| **1181** | 100 |

## $NiBr_2$

B = $AlBr_3$ (130) (A.)

0.54 M % A soluble in B at 300°; 0.78 M % A not completely sol. in B at 360°.

## $Ni_2S$

B = $Na_2S$ (84)

*v.* Fig. 28

## $Ni_2S_3$

B = $Na_2S$ (84)

*v.* Fig. 29

## $CrCl_3$

B = $AlCl_3$ (130) (A.)

<1.0 M % A soluble in B at 300°.

## $CrBr_3$

B = $AlBr_3$ (130) (A.)

<0.5 M % A soluble in B at 300°.

## $MoO_3$

B = $Na_2MoO_4$ (93)

| $t$, °C | M % A |
|---|---|
| B | |
| **791** | 0 |
| 700 | 10 |
| 553 | 20 |
| B + BA | |
| 495E | 25 |
| BA | |
| 525 | 30 |
| 574 | 40 |
| **612** | 50 |
| 593 | 60 |
| BA + B(γ) | |
| 552E | 75 |
| B(γ) + B(β) | |
| 575 | 78 |
| B(β) + B(α) | |
| 620 | 85.5 |
| B(α) | |
| **686** | 100 |
| Solid state | |
| B(γ) + B(δ) | |
| 412 | 90–100 |

B = $K_2MoO_4$ (10)

| $t$, °C | M % B |
|---|---|
| A | |
| **786** | 0 |
| 682 | 10 |
| A + $A_3B$ | |
| 526E | 20 |
| $A_3B$ | |
| **560** | 25 |
| $A_3B$ + $A_2B$ | |
| 544E | 28.5 |
| $A_2B$ | |
| **558** | 33.3 |
| 529 | 40 |
| $A_2B$ + AB | |
| 480E | 47.5 |
| AB | |
| **484** | 50 |
| AB + B | |
| 476E | 53 |
| B | |
| 620 | 60 |
| 745 | 70 |
| 829 | 80 |
| 888 | 90 |
| **926** | 100 |

## $WO_3$

B = $Na_2WO_4$ (186)

| $t$, °C | M % A |
|---|---|
| B(α) | |
| **698** | 0 |
| 665 | 10 |
| B(α) + BA | |
| 626E | 19 |
| BA | |
| 668 | 30 |
| 708 | 40 |
| **731** | 50 |
| 729 | 60 |
| BA + A (?) | |
| 723E | 67 |

B = $Na_2WO_4$.—(*Continued*)

| $t$, °C | M % A |
|---|---|
| A (?) | |
| 743 | 70 |
| A (?) + A (?) | |
| 761U(?) | 74 |
| A (?) | |
| 800 | 81 |
| Solid state | |
| B(α) + B(β) | |
| 588 | 0–50 |
| B(β) + B(γ) | |
| 564 | 0–50 |

B = $K_2WO_4$ (11)

| $t$, °C | M % B |
|---|---|
| A | |
| 875 | 25 |
| 715 | 35 |
| A + $A_2B$ | |
| 638U | 38.5 |
| $A_2B$ | |
| 593 | 45 |
| $A_2B$ + AB | |
| 548E | 48 |
| AB | |
| **555** | 50 |
| AB + B | |
| 542E | 54 |
| B | |
| 625 | 60 |
| 738 | 70 |
| 814 | 80 |
| 862 | 90 |
| **894** | 100 |

## $B_2O_3$

B = $Li_2O$ (156) (A.)

| $t$, °C | M % A |
|---|---|
| AB | |
| 722 | 47.70 |
| 760 | 50.40 |
| 750 | 53.70 |
| 720 | 55.00 |
| AB + $A_2B$ | |
| 680E | 60.36 |
| $A_2B$ | |
| 730 | 63.20 |
| 850 | 65.00 |
| 925 | 65.90 |
| 904 | 67.70 |
| 810 | 69.70 |
| $A_2B$ + $A_3B$ | |
| 655E | 71.20 |
| $A_3B$ | |
| 750 | 73.34 |
| $A_3B$ + $A_4B$ | |
| 700E | 75.90 |
| $A_4B$ | |
| 730 | 78.72 |
| $A_4B$ + $A_5B$ | |
| 620E | 81.28 |
| $A_5B$ | |
| 680 | 83.70 |
| 590 | 85.10 |
| 520 | 87.06 |

B = $Na_2O$ (203) (A.)

| $t$, °C | M % B |
|---|---|
| Mix. | |
| "vis." | 0–12 |
| $t_L$ | $t_M$* |
| 585 | 579 12.13 |
| 582 | 574 13.81 |
| 607 | 600 15.48 |
| 670 | 664 16.82 |
| 719 | 719 17.82 |
| 749 | 732 18.82 |
| 764 | 754 19.48 |
| 783† | 779 20.00 |
| 746 | 739 21.12 |
| 709 | 22.12 |
| 658 | 655 23.75 |
| 680 | 667 24.42 |
| 694‡ | 688 25.00 |
| 679 | 672 26.97 |
| 615 | 28.59 |
| 580 | 574 30.15 |
| 657 | 630 31.76 |
| 732§ | 730 33.33 |

* $t_M$ = temp. of complete fusion.
† $A_4B$. ‡ $A_3B$. § $A_2B$.

## $Al_2O_3$

B = $Na_3AlF_6$ (74, 193)

| $t$, °C | M % A |
|---|---|
| Mix. | |
| **999** | 0 0 |
| 983 | 7 10 |
| 966 | 13 20 |
| 945 | 18 30 |
| Mix. + (?) | |
| 940E | 18.5 32.5 |
| (?) | |
| 975 | 40 |
| 1072 | 50 |

## $AlF_3$

B = $CaF_2$ (73)

| | |
|---|---|
| B | |
| **1360** | 0 |
| (1315) | 10 |
| (1245) | 20 |
| 1120 | 30 |
| B + Mix. | |
| 820E | 52.5 37.5 |
| Mix. | |
| 833 | 53.5 40 |
| 875 | (61) 50 |
| 890 | 58 |

B = LiF (205)

| | |
|---|---|
| B | |
| **870** | 0 |
| 763 | 10 |
| B + $B_3A$ | |
| 710E | 14.5 |
| $B_3A$ | |
| 760 | 20 |
| **800** | 25 |
| 757 | 30 |
| $B_3A$ + A (?) | |
| 689E | 37 |

B = NaF (74, 193, 205)

| $t$, °C | M % A |
|---|---|
| Mix. | |
| **990** | 0 0 |
| 925 | (3) 10 |
| Mix. + $B_3A(\alpha)$ | |
| 885E | (4) 14 |
| $B_3A(\alpha)$ | |
| 960 | 20 |
| **1000** | 25 |
| 980 | 30 |
| 855 | 37.5 |
| $B_3A(\alpha)$ + $B_5A_3$ | |
| 725U | 40 |
| $B_5A_3$ | |
| 700 | 45 |
| $B_5A_3$ + A (?) | |
| 685E | 47 |
| A? | |
| 770 | 48.5 |
| Solid state | |
| $B_3A(\alpha)$ + $B_3A(\beta)$ | |
| 565 | 0–37.5 |

B = KF (205)

| | |
|---|---|
| B | |
| **885** | 0 |
| 850 | 5 |
| B + $B_3A$ | |
| 837E | 7 |
| $B_3A$ | |
| 885 | 10 |
| 952 | 15 |
| 1000 | 20 |
| **1035** | 25 |
| 995 | 30 |
| 920 | 35 |
| $B_3A$ + A (?) | |
| 570E(?) | 40 |

There is a transformation in solid state at 301° over 0–25 M % A.

B = RbF (205)

| | |
|---|---|
| B | |
| **833** | 0 |
| 805 | 5 |
| B + $B_3A(\alpha)$ | |
| 792E | 8 |
| $B_3A(\alpha)$ | |
| 820 | 10 |
| 930 | 20 |
| **975** | 25 |
| 915 | 30 |
| 800 | 35 |
| $B_3A(\alpha)$ + A (?) | |
| 560E | 40 |
| Solid state | |
| $B_3A(\alpha)$ + $B_3A(\beta)$ | |
| 352 | 0–40 |

B = CsF (205)

| | |
|---|---|
| B | |
| **715** | 0 |
| 685 | 5 |

B = CsF.—(*Continued*)

| $t$, °C | M % A |
|---|---|
| B + $B_3A$ | |
| 675E | 6.5 |
| $B_3A$ | |
| 728 | 10 |
| 810 | 20 |
| **823** | 25 |
| 745 | 30 |
| $B_3A$ + A (?) | |
| 490E (?) | |

## $AlCl_3$

B = $AlBr_3$ (118)

| | |
|---|---|
| B | |
| **97.4** | 0 |
| 88.5 | 9.0 |
| 79.0 | 21.2 |
| B + A | |
| 73.1E | 34.8 |
| A | |
| 84.3 | 40.6 |
| 119.8 | 57.6 |
| 133.8 | 65.0 |
| 149.8 | 76.1 |

B = $MgCl_2$ (130) (A.) M. c. t.

| $t$, °C | M % B |
|---|---|
| A | |
| **190.2** | 0 |
| 188.6 | 9.5 |
| 187.4 | 12.4 |
| 186.4 | 15.4 |
| $A_2B$ (?) | |
| 188.0 | 17.9 |
| 207.6 | 22.1 |
| 224.2 | 27.5 |
| 227.4 | 29.1 |
| B | |
| >350 | 30.9 |

B = $BaCl_2$ (130) (A.) M. c. t.

| | |
|---|---|
| A | |
| **190.2** | 0 |
| $A_2B$ (?) | |
| 191.5 | 2.0* |
| 191.5 | 13.0 |
| 192.5 | 14.0 |
| 198.8 | 20.1 |
| 209.4 | 22.8 |
| 255.5 | 27.1 |

* Two liq. layers from 2.0 to 13.0.

B = LiCl (130) (A.) M. c. t.

| | |
|---|---|
| A | |
| **190.2** | 0 |
| 190.0 | 6.6 |
| 187.9 | 17.2 |
| 171.4 | 29.6 |
| 125.6 | 38.4 |
| 114.4 | 40.1 |

### $AlCl_3$.— (*Continued*)

B = LiCl.— (*Continued*)

| *t*, °C | M % B |
|---|---|
| AB | |
| 117.8 | 43.2 |
| 132.8 | 45.8 |
| 139.9 | 47.4 |
| 143.0 | 49.6 |
| **143.5**m | 50.0 |
| B | |
| 170.4 | 49.6 |
| 338.5 | 50.5 |

B = NaCl (130) (A.)
M. c. t.

| A | |
|---|---|
| **190.2** | 0 |
| $A_xB$ | |
| 193.5 | 0.2* |
| 193.5 | 18.0 |
| 192.0 | 20.1 |
| 190.0 | 22.1 |
| 182.0 | 26.1 |
| 169.4 | 30.6 |
| 151.3 | 33.9 |
| 130.2 | 37.3 |
| AB | |
| 123.6 | 41.1 |
| 140.7 | 44.8 |
| 147.9 | 47.6 |
| 151.9 | 48.3 |
| B | |
| 153.7 | 48.4 |
| 320.5 | 49.5 |

* Two liq. layers from 0.2 to 18.0.

B = KCl (130) (A.)
M. c. t.

| A | |
|---|---|
| **190.2** | 0 |
| $A_xB$ | |
| 193.0 | 0.4* |
| 193.0 | 18.5 |
| 192.5 | 19.0 |
| 187.4 | 23.0 |
| 177.2 | 27.0 |
| 162.1 | 31.2 |
| AB | |
| 158.4 | 34.5 |
| 178.7 | 37.5 |
| 213.1 | 42.9 |
| 248.4 | 48.8 |
| B | |
| 255.5 | 49.5 |
| 375.0 | 51.5 |

* Two liq. layers from 0.4 to 18.5.

### $AlBr_3$

B = $AlI_3$ (117) (A.)
Mix. (?)

| | |
|---|---|
| **93.0** | 0 |
| 92.0 | 0.94 |
| 88.6 | 4.46 |

B = $MgBr_2$ (130) (A.)
M. c. t.

| *t*, °C | M % B |
|---|---|
| A | |
| **97.1** | 0 |
| 96.8 | 0.6 |
| 96.5m | 1.4 |
| $A_2B$ (?) | |
| 134.9 | 0.6 |
| 160.7 | 1.4 |
| 190.2 | 3.8 |
| 199.6 | 8.1 |
| 210.5 | 12.9 |
| 221.6 | 18.4 |
| 231.5 | 23.5 |
| B | |
| >360 | 24.0 |

B = $CaBr_2$ (130) (A.)
M. c. t.

| A | |
|---|---|
| **97.1** | 0 |
| $A_xB$ | |
| 208.8 | 0.8* |
| 208.8 | 14.0 |
| 195.3 | 15.4 |
| $A_2B$ | |
| 213.1 | 16.0 |
| 229.9 | 18.9 |
| 260.1 | 24.3 |
| 298.4 | 30.9 |
| **306.0** | 33.3 |
| 304.9 | 33.8 |
| B | |
| 398.0 | 33.8 |

* Two liq. layers from 0.8 to 14.0.

B = $BaBr_2$ (130) (A.)
M. c. t.

| A | |
|---|---|
| **97.1** | 0 |
| $A_2B$ | |
| 269.4 | 0.9* |
| 269.4 | 16.0 |
| 276.7 | 18.3 |
| 292.0 | 21.2 |
| 310.0 | 24.2 |
| 335.0 | 28.0 |

* Two liq. layers from 0.9 to 16.0.

B = LiBr (130) (A.)
M. c. t.

| A | |
|---|---|
| **97.1** | 0 |
| $A_7B$ | |
| 107.2 | 0.6 |
| 108.2 | 2.0 |
| 112.4 | 8.7 |
| **114.8** | 12.5 |
| 114.6 | 14.0 |
| 113.0 | 16.2 |
| $A_2B$ | |
| 117.7 | 17.1 |
| 125.2 | 25.7 |
| 129.4 | 30.6 |

B = LiBr.— (*Continued*)

| *t*, °C | M % B |
|---|---|
| AB | |
| 135.5 | 34.2 |
| 157.9 | 39.1 |
| 180.7 | 44.9 |
| 192.5 | 48.4 |
| **197.0** | 50.0 |
| 195.4 | 50.6 |
| B | |
| 221.4 | 51.4 |
| 405.0 | 56.7 |
| 510.0 | 63.9 |
| 523.0 | 74.6 |
| 532.0 | 90.0 |
| 535.0 | 100 |

B = NaBr (130) (A.)
M. c. t.

| A | |
|---|---|
| **97.1** | 0 |
| 94.8 | 0.9 |
| 93.6 | 1.4 |
| $A_xB$ | |
| 93.0 | 1.7 |
| 94.6 | 2.2 |
| 95.4 | 2.6* |
| 95.4 | 16.3 |
| 94.2 | 17.0 |
| 91.6 | 18.4 |
| 90.4 | 19.0 |
| $A_7B_2$ | |
| 92.8 | 16.9 |
| 94.0 | 18.4 |
| 95.4 | 20.5 |
| **96.0** | 22.2 |
| 95.1 | 23.4 |
| $A_2B$ | |
| 94.8 | 24.0 |
| 98.2 | 25.1 |
| 104.5 | 31.9 |
| AB | |
| 108.8 | 32.6 |
| 131.2 | 35.3 |
| 154.8 | 38.9 |
| 170.4 | 42.0 |
| 196.4 | 48.6 |
| **201.0** | 50.0 |
| 200.5 | 50.3 |
| B | |
| 269.0 | 50.3 |
| 360.0 | 51.1 |

* Two liq. layers from 2.6 to 16.3.

B = KBr (130) (A.)
M. c. t.

| A | |
|---|---|
| **97.1** | 0 |
| $A_xB$ | |
| 97.5 | 0.3 |
| 98.1 | 0.4* |
| 98.1 | 22.1 |
| 95.6 | 23.3 |
| 92.2 | 24.7 |
| $A_2B$ | |
| 88.6 | 25.8 |

B = KBr.— (*Cont'd*)

| *t*, °C | M % B |
|---|---|
| $A_2B$ | |
| 93.0 | 28.8 |
| **95.8** | 33.3 |
| AB | |
| 109.0 | 34.7 |
| 130.6 | 37.3 |
| 154.6 | 41.0 |
| 171.4 | 44.5 |
| 188.4 | 49.0 |
| **191.5** | 50.0 |
| 189.6 | 51.3 |
| B | |
| 188.8 | 52.0 |
| >390 | 54.7 |

* Two liq. layers from 0.4 to 22.1.

### $YF_3$

B = $CaF_2$ (260) (A.)

| *t*, °C | M % A |
|---|---|
| (?) | |
| **1384** | 0 |
| 1386 | 6.88 |
| 1408 | 14.26 |
| 1389 | 22.19 |
| 1367 | 30.72 |
| 1269 | 50.00 |

### $CeF_3$

B = $CaCl_2$* (24) (A.)

| | |
|---|---|
| (?) | |
| **795** | 0 |
| 1300 | 5.88 |
| 1330 | 12.34 |
| 1360 | 19.44 |
| 1350 | 36.02 |
| **1324** | 100 |

* Reciprocal salt mixtures.

B = KF (205)

| B | |
|---|---|
| **885** | 0 |
| 860 | 3.0 |
| 838 | 6.0 |
| 809 | 9.5 |
| 708 | 19.5 |
| 692 | 21.5 |
| B + (?) | |
| 660E* | 24.5 |

* All mixtures give a halting pt. at 640°–660°.

### $BeCl_2$

B = $MgCl_2$, $CaCl_2$, $BaCl_2$, LiCl, NaCl (280)

### $BeSO_4$

B = $K_2SO_4$ (94)

| B(α) | |
|---|---|
| **1071** | 0 |
| 1005 | 10 |
| 920 | 20 |
| 810 | 30 |
| B(α) + $BA_2$ | |
| 768E | 33 |

B = $K_2SO_4$.—(*Cont'd*)

| *t*, °C | M % A |
|---|---|
| $BA_2$ | |
| 820 | 40 |
| 875 | 50 |
| 910 | 60 |
| **(925)** | 66.7 |
| Solid state | |
| B(α) + B(β) | |
| 588 | 0–66 |

At >800° A decomposes considerably.

### $MgF_2$

B = $Mg_3(PO_4)_2$ (270)

| B | |
|---|---|
| **1184** | 0 |
| 1110 | 8 |
| B + BA | |
| 1076E | **11** |
| BA(α) | |
| 1170 | 30 |
| **1253** | 50 |
| 1247 | 60 |
| 1220 | 70 |
| 1165 | 80 |
| BA(α) + A | |
| 1105E | 87 |
| A | |
| 1145 | 90 |
| 1194 | 95 |
| **1220** | 100 |
| Solid state | |
| BA(α) + BA(β) | |
| 979 | 0–50 |
| BA(β) + BA(γ) | |
| 845 | 50–100 |

B = $CaF_2$ (28) (A.)

| *t*, °C | M % B |
|---|---|
| A | |
| **(1264)** | 0 |
| 1157 | 8.15 |
| 1105 | 21.02 |
| 1008 | 34.74 |
| A + B | |
| 948E* | 42.44 |
| B | |
| 954 | 44.40 |
| 1086 | 59.72 |
| 1219 | 76.16 |
| **(1396)** | 100 |

* All mixtures give a halting pt. at *ca.* 948°.

B = LiF (248)

| *t*, °C | M % A | |
|---|---|---|
| $Mix_1$ | | |
| **840** | 0 | 0 |
| 807 | 5 | 10 |
| 758 | 13 | 20 |
| 698 | 27 | 30 |
| 672 | 39 | 40 |
| $Mix_1$ + $Mix_2$ | | |
| 669 | 45 | 45 |
| $Mix_2$ + liq. | | |
| 673 | 50 | |
| 690 | 62 | |
| (1053) | (76.5) | |

### $MgCl_2$

B = $MgSO_4$ (124)

| *t*, °C | M % B |
|---|---|
| A | |
| **703** | 0 |
| 690 | 10 |
| A + B | |
| 667E | 20 |
| B | |
| 815 | 30 |
| 910 | 40 |
| 980 | 50 |
| 1035 | 60 |
| **1185** | 100 |

B = $CaCl_2$ (159)

| A | |
|---|---|
| **711** | **0** |
| 695 | 10 |
| 670 | 20 |
| 645 | 30 |
| A + B | |
| 621E | 39 |
| B | |
| 660 | 50 |
| 690 | 60 |
| 720 | 70 |
| 745 | 80 |
| 765 | 90 |
| **777** | 100 |

B = $SrCl_2$ (229)

| A | |
|---|---|
| **712** | 0 |
| 685 | 10 |
| 605 | 30 |
| 565 | 40 |
| A + B | |
| 532E | 50 |
| B | |
| 675 | 60 |
| 770 | 75 |
| 825 | 85. |
| **872** | 100 |

B = $BaCl_2$ (229)

| A | |
|---|---|
| **712** | 0 |
| 695 | 10 |
| 660 | 20 |
| 600 | 30 |
| A + $A_xB_y$ | |
| 560E | 34.5 |
| $A_xB_y$ + B(β) | |
| 590U | 38 |
| B(β) | |
| 745 | 55 |
| 845 | 70 |
| 885 | 80 |
| 910 | 90 |
| B(β) + B(α) | |
| 923 | 94 |
| B(α) | |
| **960** | 100 |

B = LiCl (229)

| t, °C | M % A |
|---|---|
| Mix. + liq. | |
| **602** | 0 |
| 588 | 10 |
| 578 | 20 |
| 570 | 40 |
| 580 | 60 |
| 593 | 70 |
| 660 | 90 |
| **712** | 100 |

B = NaCl (159, 243)

| t, °C | M % B |
|---|---|
| A | |
| **711** | 0 |
| 660 | 15 |
| 570 | 35 |
| 510 | 45 |
| A + AB | |
| 450U | 51 |
| AB + $AB_x$ | |
| 430E | 56 |
| $AB_x$ + B | |
| 468U | 61 |
| B | |
| 560 | 70 |
| 672 | 80 |
| 755 | 90 |
| **803** | 100 |

B = KCl (159)

| | |
|---|---|
| A | |
| **711** | 0 |
| 678 | 10 |
| 639 | 20 |
| 586 | 30 |
| 506 | 40 |
| A + AB | |
| 475E | 42.5 |
| AB | |
| **489** | 50 |
| 460 | 60 |
| AB + $AB_2$ | |
| 433E | 65 |
| $AB_2$ | |
| **436** | 66.7 |
| $AB_2$ + B | |
| 426E | 67.5 |
| B | |
| 497 | 70 |
| 623 | 80 |
| 710 | 90 |
| **776** | 100 |

## $MgBr_2$

B = LiBr (129)

| t, °C | M % A | |
|---|---|---|
| $Mix_1$ | | |
| **552** | 0 | 0 |
| 552 | | 10 |
| 548 | 10 | |
| 542 | | 20 |
| 514 | 20 | |
| 537 | | 30 |
| 512 | 30 | |
| 542 | | 40 |
| 534 | 40 | |

B = LiBr.—(*Cont'd*)

| t, °C | M % A | |
|---|---|---|
| $Mix_1$ + $Mix_2$ | | |
| 548U | 43 | 43 |
| | 82 | 43 |
| $Mix_2$ | | |
| 578 | (83) | 50 |
| 616 | (84) | 60 |
| 645 | (86) | 70 |
| 670 | (89) | 30 |
| 692 | (94) | 90 |
| **711** | 100 | 100 |

B = NaBr (129)

| | |
|---|---|
| B | |
| **742** | 0 |
| 707 | 10 |
| 655 | 20 |
| 570 | 30 |
| B + A | |
| 431E | 41 |
| A | |
| 500 | 50 |
| 565 | 60 |
| 625 | 70 |
| 663 | 80 |
| 690 | 90 |
| **711** | 100 |

B = KBr (129)

| | |
|---|---|
| B | |
| **730** | 0 |
| 702 | 10 |
| 627 | 20 |
| 450 | 30 |
| B + $B_2A$ | |
| **348**UE | 33.3 |
| $B_2A$ + BA | |
| 334E | 35 |
| BA | |
| 368 | 40 |
| BA + A | |
| 391U | 48 |
| A | |
| 410 | 50 |
| 500 | 60 |
| 575 | 70 |
| 638 | 80 |
| 682 | 90 |
| **711** | 100 |

## $MgSO_4$

B = $Na_2SO_4$ (91, 165)

*v.* Fig. 30

B = $K_2SO_4$ (90, 165)

| t, °C | M % B |
|---|---|
| A | |
| **1124** | 0 |
| 965 | 15 |
| A + $A_2B$ | |
| 884E | 22 |
| $A_2B$ | |
| 910 | 25 |
| **930** | 33.3 |
| 910 | 40 |
| 835 | 50 |

B = $K_2SO_4$.—(*Continued*)

| t, °C | M % B |
|---|---|
| $A_2B$ + Mix. | |
| 746E | 92 \| 62 |
| Mix. | |
| 850 | (94) \| 70 |
| 960 | (96) \| 80 |
| 1030 | (99) \| 90 |
| **1076** | 100 \| 100 |
| Solid state | |
| B(α) + B(β) | |
| 580 | 33.3–97 |
| 595 | 100 |

## CaO

B = $CaCl_2$ (19, 20, 222) (A.)

| t, °C | M % A |
|---|---|
| B | |
| **765** | 0 |
| 742 | 5.72 |
| 727 | 10.23 |
| B + A | |
| 774E | (?) |
| A* | |
| 800 | 12.96 |
| 860 ↓ | (24) |
| 940 ↓ | (24) |

$k_B$ = 40.0 (1.0).

*Slight mix. formation.

## $CaF_2$

B = $CaCl_2$ (168, 201)

| | |
|---|---|
| B | |
| **774** | 0 |
| 705 | 10 |
| B + BA | |
| 644E | 19 |
| BA | |
| 695 | 30 |
| 725 | 40 |
| BA + A | |
| 737U | 42 |
| A | |
| 820 | 50 |
| 940 | 60 |
| 1045 | 70 |
| 1140 | 80 |

B = $CaI_2$ (219) (A.)

| t, °C | M % B |
|---|---|
| (?) | |
| **1330** | 0 |
| 625* | 82.5 |
| **740** | 100 |

* Minimum $t_L$.

B = $Ca_3(PO_4)_2$ (168)

| t, °C | M % A |
|---|---|
| $B_3A$ | |
| (1650) | 25 |
| 1510 | 55 |
| 1410 | 70 |
| 1255 | 85 |
| $B_3A$ + A | |
| 1205E | 88 |

B = $Ca_3(PO_4)_2$.—(*Continued*)

| t, °C | M % A |
|---|---|
| A | |
| 1255 | 90 |
| 1335 | 95 |
| **1392** | 100 |

B = $CaSiO_3$ (127)

| | |
|---|---|
| B | |
| **1512** | 0 |
| 1380 | 10 |
| 1290 | 20 |
| 1215 | 30 |
| 1170 | 40 |
| B + A | |
| 1126E | 47 |
| A | |
| 1140 | 50 |
| 1205 | 60 |
| 1270 | 70 |
| 1330 | 80 |
| 1365 | 90 |
| **1378** | 100 |

B = NaF (75)

| t, °C | M % B |
|---|---|
| A | |
| **1360** | 0 |
| 1080 | 20 |
| 950 | 35 |
| A + B | |
| 810E | 53 |
| B | |
| 880 | 70 |
| 940 | 85 |
| **990** | 100 |

## $CaCl_2$

B = $CaBr_2$ (219) (A.)

| | |
|---|---|
| Mix. | |
| **780** | 0 |
| 735* | 60 |
| **760** | 100 |

* Minimum $t_L$.

B = $CaSO_4$ (221) (A.)

| | |
|---|---|
| A | |
| **765** | 0 |
| 748 | 4.96 |
| 738 | 6.52 |
| 733 | 8.62 |
| 727 | 10.53 |

$k_A$ = 39.0 (1.1).

B = $Ca_3(PO_4)_2$ (168)

| t, °C | M % A |
|---|---|
| $B_3A$ | |
| (1530) | 25 |
| (1500) | 50 |
| (1380) | 75 |
| 1280 | 85 |
| 1190 | 90 |
| $B_3A$ + BA | |
| 1040U | 95 |
| BA + A | |
| 770E | 99 |

B = $Ca_3(PO_4)_2$.—(*Continued*)

| t, °C | M % A |
|---|---|
| A | |
| **772** | 100 |

B = $CaCO_3$ (221) (A.)

| t, °C | M % B |
|---|---|
| A | |
| **765** | 0 |
| 751 | 3.84 |
| 741 | 5.82 |
| 732 | 7.78 |

$k_A$ = 41.0 (0.76).

B = $CaSiO_3$ (128)

| t, °C | M % A |
|---|---|
| B | |
| **1501** | 0 |
| 1460 | 10 |
| 1390 | 20 |
| 1300 | 30 |
| 1220 | 40 |
| 1170 | 50 |
| 1120 | 60 |
| 1060 | 70 |
| 990 | 80 |
| 900 | 90 |
| B + A | |
| 765E | 99 |
| A | |
| **772** | 100 |

CaO forms during melting.

B = SrO* (222) (A.)

| t, °C | M % B |
|---|---|
| A (?) Mix. | |
| **765** | 0 |
| 752 | 1.37 |
| 733 | 3.44 |
| 707 | 6.05 |

* Reciprocal salt mixtures.

B = $SrCl_2$ (229, 238, 262)

| | | |
|---|---|---|
| $Mix_1$ | | |
| **772** | 0 | 0 |
| 732 | (7) | 10 |
| 690 | (14) | 20 |
| 652 | (27) | 30 |
| $Mix_1$ + $Mix_2$ | | |
| 646 | 35 | 35 |
| $Mix_2$ | | |
| 655 | (41) | 40 |
| 690 | (54) | 50 |
| 730 | (65) | 60 |
| 770 | (76) | 70 |
| 808 | (85) | 80 |
| 842 | (93) | 90 |
| **872** | 100 | 100 |
| Solid state | | |
| Unmixing | | |
| 560 | 35 | |
| 550 | 25 | 44 |
| 535 | 20 | 50 |

B = BaO* (222) (A.)

| t, °C | M % B |
|---|---|
| A (?) Mix. | |
| **765** | 0 |
| 742 | 2.38 |
| 716 | 4.65 |

* Reciprocal salt mixtures.

B = $BaCl_2$ (219, 229, 238)

| | |
|---|---|
| A | |
| **772** | 0 |
| 715 | 10 |
| 668 | 20 |
| 620 | 30 |
| A + B(α) | |
| 600E | 35 |
| B(β) | |
| 635 | 40 |
| 700 | 50 |
| 810 | 70 |
| 907 | 90 |
| B(β) + B(α) | |
| 923 | 93 |
| B(α) | |
| **960** | 100 |

$k_A$ = 38.0 (2.5) (144) (A.)

B = $BaSO_4$* (221) (A.)

| | |
|---|---|
| A (?) Mix. | |
| **765** | 0 |
| 756 | 1.31 |
| 743 | 3.43 |
| 716 | 6.63 |

* Reciprocal salt mixtures.

B = LiCl (95, 229)

| | | |
|---|---|---|
| t, °C | M % A | |
| $Mix_1$ | | |
| **612** | 0 | 0 |
| 581 | (4) | 10 |
| 555 | (8) | 20 |
| 524 | (11) | 30 |
| $Mix_1$ + $Mix_2$ | | |
| 496E | (15) | 37.5 |
| | (85) | 37.5 |
| $Mix_2$ | | |
| 507 | (86) | 40 |
| 547 | (87) | 50 |
| 587 | (89) | 60 |
| 640 | (92) | 70 |
| 700 | (95) | 80 |
| 740 | (97) | 90 |
| **774** | 100 | 100 |
| Solid state | | |
| Unmixing | | |
| 441 | 0–100 | |

B = NaCl (159, 243)

| | |
|---|---|
| B | |
| **798** | 0 |
| 765 | 10 |
| 720 | 20 |
| 670 | 30 |
| 600 | 40 |

### $CaCl_2$.—(*Cont'd*)

B = NaCl.—(*Continued*)

| t, °C | M % A |
|---|---|
| B + A | |
| 505E | 51.5 |
| A | |
| 555 | 60 |
| 615 | 70 |
| 675 | 80 |
| 725 | 90 |
| **770** | 100 |

$k_B$ = 18.0 (5.0) (144) (A.).

B = KCl (159)

| t, °C | M % B |
|---|---|
| A | |
| **777** | 0 |
| 740 | 10 |
| 685 | 20 |
| A + AB | |
| 640E | 26 |
| AB | |
| 680 | 30 |
| 735 | 40 |
| **754** | 50 |
| 715 | 60 |
| 650 | 70 |
| AB + B | |
| 600E | 75 |
| B | |
| 650 | 80 |
| 728 | 90 |
| **776** | 100 |

### $CaBr_2$

B = LiBr (129)

| t, °C | M % A | |
|---|---|---|
| $Mix_1$ | | |
| **552** | 0 | 0 |
| 552 | | 10 |
| 542 | 10 | |
| 551 | | 20 |
| 532 | 20 | |
| 545 | | 30 |
| 533 | 30 | |
| 552 | | 40 |
| 544 | 40 | |
| $Mix_1$ + $Mix_2$ | | |
| 562E | 42.5 | 42.5 |
| | 82 | 42.5 |
| $Mix_2$ | | |
| 578 | 83 | 50 |
| 590 | 83 | 60 |
| 628 | 85 | 70 |
| 688 | 92 | 80 |
| 722 | 98 | 90 |
| **730** | 100 | 100 |

B = NaBr (129)

| | | |
|---|---|---|
| $Mix_1$ | | |
| **742** | 0 | 0 |
| 715 | 7 | 10 |
| 678 | 14 | 20 |
| 630 | 20 | 30 |
| 580 | 26 | 40 |
| **535** | 30 | 50 |

B = NaBr.—(*Continued*)

| t, °C | M % A | |
|---|---|---|
| $Mix_1$ + $Mix_2$ | | |
| 514E | 32 | 60 |
| | 87 | 60 |
| $Mix_2$ | | |
| 598 | 90 | 70 |
| 650 | 93 | 80 |
| 695 | 96 | 90 |
| **730** | 100 | 100 |

$A_2B$ forms below 468°.

B = KBr (129)

| | |
|---|---|
| B | |
| **730** | 0 |
| 695 | 10 |
| 643 | 20 |
| 585 | 30 |
| B + BA | |
| 545E | 35.5 |
| BA | |
| 610 | 40 |
| **637** | 50 |
| 615 | 60 |
| BA + A | |
| 562E | 67 |
| A | |
| 580 | 70 |
| 635 | 80 |
| 687 | 90 |
| **730** | 100 |

### CaS

B = $CaSiO_3$ (146)

| | | |
|---|---|---|
| Mix. | | |
| **1512** | 0 | 0 |
| 1480 | 3 | 10 |
| 1460 | 7 | 20 |
| 1445 | 9 | 30 |
| 1425 | 14 | 40 |
| 1395 | 30 | 50 |
| 1370 | 50 | |
| Solid state Unmixing | | |
| 1301 | 20 | |
| 1250 | 7 | 29 |
| 1200 | 4 | 33 |
| 1150 | | 35 |

### $CaSO_4$

B = $Li_2SO_4$ (164)

| | |
|---|---|
| B(α) | |
| **843** | 0 |
| 755 | 10 |
| B(α) + A | |
| 700E | 18 |
| A | |
| 760 | 25 |
| 820 | 30 |
| 912 | 40 |
| 990 | 50 |
| 1055 | 60 |
| 1122 | 70 |
| A decomposes above 1200°. | |

B = $Na_2SO_4$ (48, 164)

| t, °C | M % A | |
|---|---|---|
| $Mix_1$ | | |
| **881** | 0 | 0 |
| 913 | (12) | 5 |
| 955 | (16) | 10 |
| $B_4A$ | | |
| **944** | 20 | |
| $Mix_2$ | | |
| 940 | (21) | 30 |
| $Mix_2$ + A | | |
| 913E | (33) | 40 |
| A | | |
| 940 | 50 | |
| 995 | 60 | |
| 1070 | 70 | |
| 1155 | 80 | |
| Solid state | | |
| B(α) + B(β) | | |
| 231 | 0 | |
| 200 | 2½ | |
| 178 | 4 | |
| 200 | 6½ | |
| 240 | 15 | |

B = $K_2SO_4$ (94, 164)

| | | |
|---|---|---|
| Mix. | | |
| **1057** | 0 | 0 |
| 1040 | (1) | 10 |
| 1008 | (3) | 20 |
| 955 | (6) | 30 |
| Mix. + $BA_2(\beta)$ | | |
| 867E | (10) | 42 |
| $BA_2(\beta)$ | | |
| 920 | 50 | |
| $BA_2(\beta)$ + $BA_2(\alpha)$ | | |
| 936 | 56 | |
| $BA_2(\alpha)$ | | |
| 985 | 60 | |
| $BA_2(\alpha)$ + A | | |
| 1004UE | 66.7 | |
| A | | |
| 1050 | 70 | |
| 1150 | 80 | |
| Solid state | | |
| B(α) + B(β) | | |
| 580 | 0 | |
| 553 | 5–66 | |

B = $Rb_2SO_4$ (164) *v.* Fig. 31 >1200° A decomposes.

### $Ca(NO_3)_2$

B = $NaNO_3$ (160) (A.)

| | |
|---|---|
| B | |
| **315.1** | 0 |
| 303.9 | 5.27 |
| 285.6 | 11.11 |
| 272.9 | 17.65 |
| 249.8 | 25.00 |
| B + A | |
| 236.5E | 33.33 |

B = $NaNO_3$.—(*Continued*)

| t, °C | M % A |
|---|---|
| A | |
| 284.1 | 42.86 |
| 355.4 | 53.85 |
| 421.0 | 66.66 |
| 490.0 | 81.82 |

B = $KNO_3$ (160) (A.)

| | |
|---|---|
| B | |
| **346.0** | 0 |
| 318.5 | 5.27 |
| 295.2 | 11.11 |
| 262.2 | 17.65 |
| B + A | |
| 210.5E | 25.00 |
| A | |
| 221.9 | 33.33 |
| 263.3 | 42.86 |
| 345.3 | 53.85 |
| 450.0 | 66.66 |
| 508.4 | 81.82 |

### $Ca_3(PO_4)_2$

B = $Na_2B_4O_7$* (204) (A.) (?)

| | |
|---|---|
| **732** | 0 |
| 655 | 3.30 |
| 475 | 6.74 |
| 575 | 10.30 |
| 640 | 14.00 |

* Reciprocal salt mixtures.

### $CaCO_3$*

B = $Na_2CO_3$† (172) Mix.

| | | |
|---|---|---|
| **860** | 0 | 0 |
| 872 | (6) | 5 |
| 875 | (7) | 7 |
| 870 | (10) | 15 |
| 851 | (20) | 25 |
| 812 | (27) | 35 |
| Mix. + AB | | |
| 786E | 28 | 38 |
| AB | | |
| 800 | 40 | |
| **812** | 50 | |

B = $K_2CO_3$† (172) Mix.

| | | |
|---|---|---|
| **896** | 0 | 0 |
| 888 | (4) | 10 |
| 849 | (10) | 20 |
| 803 | (13) | 30 |
| Mix. + AB | | |
| 753E | 17 | 39 |
| AB | | |
| 777 | 40 | |
| 800 | 45 | |
| **814** | 50 | |

* A decomposes above 50 M %

† Under 1 atm. $CO_2$.

### $CaSiO_3$

B = $CaTiO_3$ (245)

| t, °C | M % B |
|---|---|
| Mix. | |
| **1512** | 0 |
| 1460 | 10 |
| 1435 | 20 |
| 1425 | 30 |
| 1430 | 40 |
| 1440 | 50 |
| 1465 | 60 |
| 1490 | 75 |
| Solid state Unmixing | |
| 1350 | 49 |
| 1300 | 34 61 |
| 1250 | 28 64 |
| 1200 | 23 |

### SrO

B = $SrCl_2$ (20, 222) (A.)

| t, °C | M % A |
|---|---|
| B | |
| **873** | 0 |
| 846 | 3.81 |
| 834 | 5.26 |
| 807 | 8.05 |
| 797 | 11.38 |
| A (?) | |
| 910 | 25.40 |

$k_B$ = 107 (0.81).

B = $BaCl_2$*(222) (A.)

| | |
|---|---|
| B (?) Mix. | |
| **960** | 0 |
| 925 | 3.42 |
| 907 | 6.32 |
| 897 | 7.87 |

* Reciprocal salt mixtures.

### $SrF_2$

B = $SrCl_2$ (201, 270)

| | |
|---|---|
| B | |
| **874** | 0 |
| 815 | 5 |
| B + BA | |
| 753E | 13 |
| BA | |
| 890 | 25 |
| **962** | 50 |
| BA + A | |
| 952E | 63 |
| A | |
| 1045 | 70 |
| 1165 | 80 |
| **1400** | 100 |

B = $Sr_3(PO_4)_2$ (270)

| t, °C | M % B |
|---|---|
| A | |
| **1400** | 0 |
| 1325 | 5 |
| A + $AB_3$ | |
| 1207E | 10 |

B = $Sr_3(PO_4)_2$.—(*Continued*)

| t, °C | M % B |
|---|---|
| $AB_3$ | |
| 1350 | 20 |
| **1685** | 75 |

B = $BaF_2$ (28) (A.)

| | |
|---|---|
| Mix. | |
| 1146 | 15.12 |
| 1188 | 23.42 |
| 1174 | 41.64 |
| 1200 | 62.47 |

### $SrCl_2$

B = $SrSO_4$ (221) (A.)

| | |
|---|---|
| A | |
| **873** | 0 |
| 842 | 4.61 |
| 828 | 7.08 |
| 813 | 9.35 |

$k_A$ = 95 (0.65).

B = $Sr_3(PO_4)_2$ (270)

| | |
|---|---|
| A | |
| **874** | 0 |
| A + $AB_3$ | |
| 828E | 2 |
| $AB_3$ | |
| 930 | 5 |
| 1070 | 10 |
| 1235 | 20 |
| 1625 | 75 |

B = $SrCO_3$ (221) (A.)

| | |
|---|---|
| A | |
| **873** | 0 |
| 854 | 2.70 |
| 841 | 4.25 |
| 829 | 6.25 |
| 817 | 8.29 |

$k_A$ = 107 (0.57).

B = BaO* (222)

| t, °C | M % A |
|---|---|
| B (?) Mix. | |
| **960** | 0 |
| 934 | 2.17 |
| 905 | 3.60 |
| 890 | 6.66 |

* Reciprocal salt mixtures.

B = $BaCl_2$ (219, 229, 262)

| t, °C | M % B |
|---|---|
| Mix. + liq. | |
| **870** | 0 |
| 860 | 10 |
| 850 | 20 |
| 847 | 30 |
| 850 | 40 |
| 860 | 50 |
| 870 | 60 |
| 885 | 70 |
| 905 | 80 |
| 930 | 90 |
| **955** | 100 |

B = $BaCl_2$.— (*Continued*)

| *t*, °C | M % B |
|---|---|
| Solid state | |
| B(α) + B(β) | |
| 635 | 10 |
| 640 | 20 |
| 660 | 30 |
| 685 | 40 |
| 715 | 50 |
| 755 | 60 |
| 790 | 70 |
| 835 | 80 |
| 875 | 90 |
| 922 | 100 |

B = LiCl (229)

| *t*, °C | M % A |
|---|---|
| B | |
| **602** | 0 |
| 590 | 10 |
| 568 | 20 |
| 536 | 30 |
| B + A | |
| 473E | 47 |
| A | |
| 500 | 50 |
| 584 | 60 |
| 660 | 70 |
| 737 | 80 |
| 808 | 90 |
| **872** | 100 |

B = NaCl (144, 262)

| | |
|---|---|
| B | |
| **798** | 0 |
| 762 | 10 |
| 720 | 20 |
| 673 | 30 |
| 620 | 40 |
| B + A | |
| 565E | 50 |
| A | |
| 624 ↓ | 60 |
| **870** | 100 |

$k_B$ = 17.6 (5.0) (A.).

B = KCl (262)

| | |
|---|---|
| B | |
| **775** | 0 |
| 727 | 10 |
| 666 | 20 |
| B + $B_2A$ | |
| 596E | 28 |
| $B_2A$ | |
| **597** | 33.3 |
| 587 | 40 |
| $B_2A$ + $BA_2$ | |
| 575E | 43 |
| $BA_2$ | |
| 605 | 50 |
| 632 | 60 |
| $BA_2$ + A | |
| 638UE | 66.7 |

B = KCl.— (*Continued*)

| *t*, °C | M % A |
|---|---|
| A | |
| 665 | 70 |
| 743 | 80 |
| 810 | 90 |
| **870** | 100 |

## $SrBr_2$

B = LiBr (129)

| | |
|---|---|
| B | |
| **552** | 0 |
| 498 | 20 |
| B + $A_2B$ | |
| 453E | 33 |
| $A_2B$ | |
| 472 | 40 |
| 492 | 50 |
| $A_2B$ + A | |
| 503U | 61.5 |
| A | |
| 558 | 75 |
| 595 | 85 |
| **643** | 100 |

B = NaBr (129)

| | |
|---|---|
| B | |
| **742** | 0 |
| 695 | 15 |
| 635 | 30 |
| 567 | 45 |
| B + A | |
| 486E | 61 |
| A | |
| 547 | 75 |
| 608 | 90 |
| **643** | 100 |

B = KBr (129)

| | |
|---|---|
| B | |
| **730** | 0 |
| 698 | 10 |
| 600 | 25 |
| B + $B_2A$ | |
| 556E | 29 |
| $B_2A$ | |
| **559** | 33.3 |
| 554 | 40 |
| $B_2A$ + $BA_2$ | |
| 534E | 50 |
| $BA_2$ | |
| 566 | 60 |
| **574** | 66.7 |
| 570 | 75 |
| $BA_2$ + A | |
| 562E | 82 |
| A | |
| 601 | 90 |
| **643** | 100 |

## $SrSO_4$

B = $Li_2SO_4$ (51)

| | |
|---|---|
| B(α) | |
| **856** | 0 |
| 792 | 10 |
| B(α) + A | |
| 746E | 16.5 |

B = $Li_2SO_4$.— (*Continued*)

| *t*, °C | M % A |
|---|---|
| A | |
| 830 | 20 |
| 940 | 30 |
| 1010 | 40 |
| 1070 | 50 |
| 1140* | 65 |
| (**1225**) | 100 |
| Solid state | |
| B(α) + B(β) | |
| 585 | 0–65 |

* Decompn. of A above 80 M %.

B = $Na_2SO_4$ (48, 49)

| | |
|---|---|
| Mix. + liq. | |
| **887** | 0 |
| 945 | 10 |
| 973 | 25* |
| 970 | 30 |
| Mix. + A | |
| 955E | 39 |
| A | |
| 1055 | 50 |
| 1115 | 60 |
| 1155 | 70† |
| Solid state | |
| Mix. + A | |
| 900 | 36 |
| 800 | 30 |
| 700 | 24 |
| 500 | 13 |
| 300 | 5 |
| B(α) + B(β) | |
| 234 | 0 |
| 224 | 3–70 |

* Possible formation of $B_3A$.

† Decompn. of A above 70 M %.

B = $K_2SO_4$ (48, 49, 94)

| Mix. | | |
|---|---|---|
| **1071** | 0 | 0 |
| 1080 | | 5 |
| 1063 | (9) | 15 |
| 1005 | (18) | 30 |
| Mix. + $A_2B(\alpha)$ | | |
| 970E | 22 | 37 |
| $A_2B(\alpha)$ + A(β) | | |
| 980U | 41.5 | |
| A(β) | | |
| 1075 | 50 | |
| A(β) + A(α) | | |
| 1152 | 60 | |
| A(α) | | |
| **1605** | 100 | |
| Solid state | | |
| B(α) + B(β) | | |
| 588 | 0 | |
| 560 | 5–66.7 | |
| $A_2B(\alpha)$ + $A_2B(\beta)$ | | |
| 775 | 20–60 | |
| Mix. + $A_2B(\alpha)$ | | |
| 900 | 21.5 | |
| 800 | 20.5 | |

B = $K_2SO_4$.— (*Continued*)

| *t*, °C | M % A |
|---|---|
| Mix. + $A_2B(\beta)$ | |
| 700 | 15 |
| 600 | 8 |

## $SrCO_3$

B = NaCl* (221) (A.)

| |
|---|
| B |
| **802** \| 0 |
| 794 \| 1.27 |
| 787 \| 2.51 |
| 776 \| 3.77 |
| 772 \| 5.05 |

* Reciprocal salt mixtures.

## BaO

B = $BaCl_2$ (19, 222) (A.)

| |
|---|
| B |
| **960** \| 0 |
| 938 \| 2.03 |
| 920 \| 5.14 |
| 905 \| 8.57 |
| 892 \| 13.04 |
| 870* \| 32.08 |

* Minimum $t_L$.

## $BaF_2$

B = $BaCl_2$ (201, 270)

| | |
|---|---|
| B | |
| **958** | 0 |
| 895 | 10 |
| B + BA | |
| 844E | 19.5 |
| BA | |
| 948 | 30 |
| 995 | 40 |
| **1008** | 50 |
| 995 | 60 |
| 955 | 70 |
| BA + A | |
| 936E | 73 |
| A | |
| 1018 | 80 |
| **1289** | 100 |

B = $BaI_2$ (219) (A.)

| *t*, °C | M % B |
|---|---|
| (?) | |
| **1280** | 0 |
| 670* | 92.5 |

* Minimum $t_L$.

B = $Ba_3(PO_4)_2$ (270)

| | |
|---|---|
| A | |
| **1289** | 0 |
| 1150 | 10 |
| A + $AB_3$ | |
| 1092E | 13 |
| $AB_3$ | |
| 1195 | 20 |
| 1300 | 30 |
| 1380 | 40 |
| 1670 | 75 |

B = KF (203)

| *t*, °C | M % A |
|---|---|
| B | |
| **885** | 0 |
| 867 | 10 |
| 847 | 20 |
| 825 | 30 |
| 800 | 40 |
| 770 | 50 |
| B + A | |
| 750E | 55 |
| A | |
| 790 | 60 |
| 885 | 70 |
| 1000 | 80 |
| 1130 | 90 |
| **1280** | 100 |

## $BaCl_2$

B = $BaBr_2$ (219) (A.)

| *t*, °C | M % B |
|---|---|
| Mix. (?) | |
| **960** | 0 |
| 870* | 90 |
| **880** | 100 |

* Minimum $t_L$.

B = $BaI_2$ (219) (A.)

| |
|---|
| Mix. (?) |
| **960** \| 0 |
| 700* \| 90 |
| **740** \| 100 |

* Minimum $t_L$.

B = $BaSO_4$ (221) (A.)

| | |
|---|---|
| A | |
| **960** | 0 |
| 943 | 2.04 |
| 926 | 4.38 |
| 908 | 7.81 |
| 897 | 10.74 |

B = $Ba_3(PO_4)_2$ (270)

| | |
|---|---|
| A | |
| **958** | 0 |
| A + B | |
| 898E | 4.5 |
| B | |
| 1015 | 7.5 |
| 1065 | 10 |
| 1215 | 20 |
| **1584** | 100 |

B = $BaCO_3$ (221) (A.)

| | |
|---|---|
| A | |
| **960** | 0 |
| 907 | 6.97 |
| 900 | 9.43 |
| 888 | 13.41 |

B = $BaSiO_3$ (261)

| *t*, °C | M % A |
|---|---|
| B | |
| **1464** | 0 |
| 1370 | 10 |
| 1265 | 20 |
| 1180 | 30 |

B = $BaSiO_3$.— (*Continued*)

| *t*, °C | M % A |
|---|---|
| B | |
| 1120 | 40 |
| 1070 | 50 |
| 1035 | 60 |
| 1000 | 70 |
| 965 | 80 |
| 920 | 90 |
| B + A | |
| 902E | 92.5 |
| A | |
| 942 | 95 |
| **968** | 100 |

B = $BaCrO_4$ (219) (A.)

| *t*, °C | M % B |
|---|---|
| A | |
| **960** | 0 |
| 940 | 3.03 |
| 920 | 5.70 |
| 902 | 8.92 |
| 894 | 11.36 |

B = LiCl (229)

| *t*, °C | M % A |
|---|---|
| B | |
| **602** | 0 |
| 584 | 10 |
| 560 | 20 |
| 530 | 30 |
| B + A(β) | |
| 510E | 35 |
| A(β) | |
| 560 | 40 |
| 650 | 50 |
| 715 | 60 |
| 775 | 70 |
| 830 | 80 |
| 880 | 90 |
| A(β) + A(α) | |
| 923 | 97 |
| A(α) | |
| **960** | 100 |

B = NaCl (87)

| | |
|---|---|
| B | |
| **798** | 0 |
| 764 | 10 |
| 755 | 20 |
| 693 | 30 |
| B + A(β) | |
| 654E | 40 |
| A(β) | |
| 715 | 50 |
| 770 | 60 |
| 817 | 70 |
| 861 | 80 |
| 900 | 90 |
| A(β) + A(α) | |
| 930 | 96.5 |
| A(α) | |
| **955** | 100 |

$k_B$ = 22.0 (1.2) (221) (A.).

### $BaCl_2$.— (*Continued*)

B = KCl (87, 154, 262)

| *t*, °C | M % A |
|---|---|
| B | |
| **775** | 0 |
| 735 | 10 |
| 685 | 20 |
| B + $B_2A$ | |
| 660E | 24.5 |
| $B_2A$ | |
| 662 | 30 |
| **663** | 33.3 |
| 660 | 40 |
| $B_2A$ + A($\beta$) | |
| 652E | 45 |
| A($\beta$) | |
| 690 | 50 |
| 760 | 60 |
| 820 | 70 |
| 870 | 80 |
| 910 | 90 |
| A($\beta$) + A($\alpha$) | |
| 930 | 96 |
| A($\alpha$) | |
| **955** | 100 |

### $Ba(ClO_3)_2$

B = $NaClO_3$ (78) (A.)

| B | |
|---|---|
| **255.0** | 0 |
| 254.2 | 0.81 |
| 252.9 | 2.02 |
| 251.2 | 3.56 |

$k_B$ = 10.9 (0.35).

### $BaBr_2$

B = LiBr (129)

| B | |
|---|---|
| **552** | 0 |
| 525 | 10 |
| 497 | 20 |
| B + A | |
| 484E | 25 |
| A | |
| 509 | 30 |
| 563 | 40 |
| 670 | 60 |
| 760 | 80 |
| **847** | 100 |

B = NaBr (129)

| B | |
|---|---|
| **742** | 0 |
| 709 | 10 |
| 674 | 20 |
| 635 | 30 |
| B + A | |
| 599E | 40 |
| A | |
| 648 | 50 |
| 693 | 60 |
| 777 | 80 |
| 813 | 90 |
| **847** | 100 |

B = KBr (129)

| *t*, °C | M % A |
|---|---|
| B | |
| **730** | 0 |
| 693 | 10 |
| 647 | 20 |
| B + $B_2A$ | |
| 633E | 22.5 |
| $B_2A$ | |
| 634 | 30 |
| 635 | 33.3 |
| 630 | 40 |
| 616 | 50 |
| $B_2A$ + A | |
| 612E | 53 |
| A | |
| 655 | 60 |
| 712 | 70 |
| 770 | 80 |
| 814 | 90 |
| **847** | 100 |

### BaS

B = $BaSiO_3$ (261)

| B | |
|---|---|
| **1464** | 0 |
| 1420 | 10 |
| 1360 | 20 |
| B + A (?) | |
| 1325E | 25 |
| A (?) | |
| 1375 | 30 |
| 1475 | 40 |

### $BaSO_4$

B = $Li_2SO_4$ (51)

| B($\alpha$) | |
|---|---|
| **856** | 0 |
| 801 | 5 |
| B($\alpha$) + A | |
| 760E | 9 |
| A | |
| 835 | 15 |
| 1010 | 30 |
| 1095 | 40 |
| 1125 | 45 |
| (**1350**) | 100 |
| Solid state | |
| B($\alpha$) + B($\beta$) | |
| 585 | 0–45 |

>1000° A decomposes considerably.

B = NaCl* (219) (A.)

| B | |
|---|---|
| **802** | 0 |
| 784 | 2.78 |
| 775 | 4.31 |
| 765 | 5.84 |

* Reciprocal salt mixtures.

B = $Na_2SO_4$ (48)

| Mix. + liq. | |
|---|---|
| **887** | 0 |
| 917 | 10 |
| 921 | 15 |

B = $Na_2SO_4$.— (*Continued*)

| *t*, °C | M % A |
|---|---|
| Mix. + A | |
| 913E | 20 |
| A | |
| 990 | 30 |
| 1050 | 40 |
| 1110 | 50 |
| 1160* | 58 |
| **1345** | 100 |
| Solid state | |
| B($\alpha$) + B($\beta$) | |
| 240 | 0 |
| 230 | 2–60 |
| Mix. + A | |
| 800 | 15.5 |
| 700 | 10.5 |
| 600 | 7 |

* Decompn. of A above 1100°.

B = KCl* (221) (A.)

| B | |
|---|---|
| **771** | 0 |
| 752 | 3.04 |
| 736 | 5.96 |
| 727 | 7.27 |

* Reciprocal salt mixtures.

B = $K_2SO_4$ (48, 49, 94)

| Mix. | | |
|---|---|---|
| **1071** | 0 | 0 |
| 1081 | 10 | 10 |
| 1060 | (16) | 20 |
| Mix. + A($\beta$) | | |
| 1016E | 24 | 30 |
| A($\beta$) | | |
| 1090 | 40 | |
| A($\beta$) + A($\alpha$) | | |
| 1149 | 48 | |
| A($\alpha$) | | |
| 1265 | 60 | |
| **1580** | 100 | |
| Solid state | | |
| B($\alpha$) + B($\beta$) | | |
| 588 | 0 | |
| 572 | 2–100 | |
| Mix. + A | | |
| 950 | 19.5 | |
| 800 | 10 | |
| 700 | 5.5 | |

### $Ba(NO_3)_2$

B = $LiNO_3$ (107) (A.)

| *t*, °C | M % B |
|---|---|
| B | |
| 436.6 | 75.00 |
| 403.6 | 82.35 |
| 364.4 | 88.88 |
| 303.2 | 94.73 |
| **254.1** | 100 |

B = $NaNO_3$ (107) (A.)

| *t*, °C | M % A |
|---|---|
| B | |
| **314.1** | 0 |
| 296.6 | 5.27 |
| B + A | |
| 358.3E | 11.11 |
| A | |
| 396.5 | 17.65 |
| 435.3 | 25.00 |
| 463.0 | 33.33 |
| 484.2 | 42.86 |
| 492.6 | 53.85 |
| 501.7 | 66.66 |
| 529.6 | 81.82 |
| **595.5** | 100 |

B = $KNO_3$ (107) (A.)

| B | |
|---|---|
| **346.3** | 0 |
| 333.8 | 5.27 |
| B + A | |
| 311.9E | 11.11 |
| A | |
| 350.0 | 17.65 |
| 380.0 | 25.00 |
| 434 0 | 33.33 |
| 474.3 | 42.86 |
| 493.9 | 53.85 |
| 495.3 | 66.66 |
| 514.4 | 81.82 |
| **595.5** | 100 |

### $BaCO_3$

B = $Na_2CO_3$ (221) (A.)

| B | |
|---|---|
| **860** | 0 |
| 843 | 5.89 |
| 837 | 7.37 |
| 828 | 10.29 |
| 823 | 12.21 |

$k_B$ = 29.5 (1.3).

### LiOH

B = LiF (237)

| Mix$_1$ | | |
|---|---|---|
| **840** | 0 | 0 |
| 807 | (1) | 10 |
| 770 | (2) | 20 |
| 730 | (2) | 30 |
| 683 | (3) | 40 |
| 630 | (3) | 50 |
| 565 | (3) | 60 |
| 490 | (3) | 70 |
| Mix$_1$ + Mix$_2$ | | |
| 430E | 3 | 80 |
| | 90 | 80 |
| Mix$_2$ | | |
| 447 | 96 | 90 |
| **462** | 100 | 100 |

B = LiCl (237)

| *t*, °C | M % A |
|---|---|
| B | |
| **605** | 0 |
| 540 | 10 |
| 500 | 20 |
| 477 | 30 |
| 383 | 40 |
| B + $A_2B_3$ | |
| 315U | 50 |
| $A_2B_3$ | |
| 298 | 60 |
| $A_2B_3$ + A | |
| 290E | 63 |
| A | |
| 325 | 70 |
| **462** ↓ | 100 |

B = LiBr (237)

| B | |
|---|---|
| **550** | 0 |
| 490 | 10 |
| 443 | 20 |
| 384 | 30 |
| 315 | 40 |
| B + $BA_3$ | |
| 275E | 45 |
| $BA_3$ | |
| 302 | 60 |
| $BA_3$ + A | |
| 310U | 65 |
| A | |
| 332 | 70 |
| 380 | 80 |
| 423 | 90 |
| **462** | 100 |

B = LiI (237)

| B | |
|---|---|
| **440** | 0 |
| 370 | 10 |
| 305 | 20 |
| 250 | 30 |
| 203 | 40 |
| B + $BA_4$ | |
| 180E | 45.5 |
| $BA_4$ | |
| 235 | 50 |
| 295 | 60 |
| 320 | 70 |
| $BA_4$ + A | |
| 330U | 78 |
| A | |
| 405 | 90 |
| **462** | 100 |

### LiCl

B = NaCl (215, 238, 278)

| *t*, °C | M % B | |
|---|---|---|
| Mix$_1$ | | |
| **614** | 0 | 0 |
| 587 | 7 | 10 |
| 566 | 15 | 20 |

B = NaCl.— (*Continued*)

| *t*, °C | M % B | |
|---|---|---|
| Mix$_1$ + Mix$_2$ | | |
| 552 | 28 | 28 |
| Mix$_2$ | | |
| 570 | 42 | 35 |
| 582 | 50 | 40 |
| 615 | 62 | 50 |
| 655 | 72 | 60 |
| 698 | 83 | 70 |
| 738 | 89 | 80 |
| 780 | 95 | 90 |
| **819** | 100 | 100 |
| Solid state | | |
| Unmixing | | |
| 291 | 22.5 | |
| 301 | 25 | |
| 306 | 30 | |
| 314 | 35 | |
| 312 | 40 | |
| 302 | 50 | |
| 299 | 55 | |

B = KCl (238, 278)

| A | |
|---|---|
| **614** | 0 |
| 569 | 10 |
| 510 | 20 |
| 443 | 30 |
| A + B | |
| 352E | 41 |
| B | |
| 450 | 50 |
| 532 | 60 |
| 605 | 70 |
| 673 | 80 |
| 735 | 90 |
| **790** | 100 |

B = RbCl (215, 278)

| A | |
|---|---|
| **614** | 0 |
| 568 | 10 |
| 511 | 20 |
| 438 | 30 |
| 352 | 40 |
| A + B | |
| 312E | 44.5 |
| B | |
| 367 | 50 |
| 460 | 60 |
| 550 | 70 |
| 623 | 80 |
| 680 | 90 |
| **726** | 100 |

B = CsCl (138)

| *t*, °C | M % A |
|---|---|
| B($\alpha$) | |
| **635** | 0 |
| 605 | 10 |
| 520 | 25 |
| B($\alpha$) + B($\beta$) | |
| 479 | 30 |
| B($\beta$) | |
| 438 | 35 |

B = CsCl.—
(*Continued*)

| t, °C | M % A |
|---|---|
| B(β) + B₂A(α) | |
| 380U | 41 |
| B₂A(α) + B₂A(β) | |
| 360 | 46 |
| B₂A(β) + BA | |
| 350UE | 50 |
| BA + B | |
| 332E | 57 |
| B | |
| 347 | 60 |
| 415 | 70 |
| 500 | 80 |
| 560 | 90 |
| 609 | 100 |

## LiBr

B = NaBr (129)

| t, °C | M % B | |
|---|---|---|
| Mix₁ | | |
| 552 | 0 | 0 |
| 535 | 6 | 10 |
| Mix₁ + Mix₂ | | |
| 525 | 20 | 20 |
| Mix₂ | | |
| 537 | 41 | 30 |
| 595 | 65 | 50 |
| 660 | 82 | 70 |
| 715 | 95 | 90 |
| 742 | 100 | 100 |

B = KBr (129)

| | |
|---|---|
| A | |
| 552 | 0 |
| 514 | 10 |
| 465 | 20 |
| 410 | 30 |
| A + B | |
| 348E | 40 |
| B | |
| 445 | 50 |
| 535 | 60 |
| 608 | 70 |
| 663 | 80 |
| 702 | 90 |
| 730 | 100 |

## $Li_2SO_4$

B = $LiNO_3$ (7)

| t, °C | M % A |
|---|---|
| B | |
| 255 | 0 |
| B + A | |
| 252E | 2 |
| A | |
| 350 | 5 |
| 435 | 10 |
| 555* | 22 |
| 860 | 100 |

* Decompn. above 600°.

B = $Li_2CO_3$ (2)

| | | |
|---|---|---|
| Mix₁ | | |
| 732 | 0 | 0 |
| 645 | (4) | 30 |
| 610 | (5) | 40 |

B = $Li_2CO_3$.—
(*Continued*)

| t, °C | M % A |
|---|---|
| Mix₁ + Mix₂ | |
| 530E | 6 \| 60.5 |
| | 90 \| 60.5 |
| Mix₂ | |
| 617 | (92.5) 70 |
| 860 | 100 100 |
| Solid state | |
| A(α) + A(β) | |
| 550 | 92.5 |
| 578 | 100 |

B = $Na_2SO_4$ (166)
*v.* Fig. 32

B = $K_2SO_4$ (166)
*v. also* Fig. 33

| t, °C | M % B |
|---|---|
| B(α) | |
| 899 | 80 |
| 990 | 90 |
| 1076 | 100 |

At 420 and 435° there is a transformation of AB.

## $LiNO_3$

B = $Li_2CO_3$ (7)

| | |
|---|---|
| A | |
| 255 | 0 |
| A + B | |
| 250E | 2 |
| B | |
| 395 | 5 |
| 500 | 10 |
| 590 | 20 |
| 620* | 30 |
| 732 | 100 |

* Decompn. above 600°.

B = $NaNO_3$
(62) (A.)
Mix. (?)

| | |
|---|---|
| 253 | 0 |
| 244 | 8.28 |
| 234 | 16.87 |
| 223 | 25.81 |
| 214 | 35.12 |
| 206 | 44.80 |
| 217 | 54.91 |
| 236 | 65.46 |
| 259 | 76.46 |
| 283 | 87.96 |
| 308 | 100 |

B = $KNO_3$
(60, 107) (A.)

| t, °C | M % A |
|---|---|
| B | |
| 337 | 0 |
| 290 | 14.00 |
| 255 | 20.46 |
| 223 | 26.80 |
| 186 | 32.80 |
| 139 | 38.56 |

B = $KNO_3$.—
(*Continued*)

| t, °C | M % A |
|---|---|
| A | |
| 143 | 49.40 |
| 174 | 59.42 |
| 200 | 68.72 |
| 224 | 81.46 |
| 242 | 92.14 |
| 253 | 100 |

## $Li_2CO_3$

B = $K_2CO_3$
(64) (A.)

| | |
|---|---|
| B | |
| 860 | 0 |
| 777 | 9.0 |
| 720 | 16.5 |
| 682 | 20.0 |
| 590 | 31.0 |
| 515 | 39.5 |
| BA | |
| 492m | 33.0 |
| 500m | 39.5 |
| 505 | 44.2 |
| 515 | 50.0 |
| 505 | 54.5 |
| 492 | 62.0 |
| A | |
| 525 | 66.6 |
| 600 | 77.0 |
| 638 | 83.5 |
| 673 | 91.0 |
| 710 | 100 |

## $LiBO_2$

B = $NaBO_2$ (134)

| | | |
|---|---|---|
| Mix₁ | | |
| 966 | 0 | 0 |
| 910 | (1) | 15 |
| 865 | (1) | 25 |
| 810 | (2) | 35 |
| 735 | (2) | 45 |
| Mix₁ + Mix₂ | | |
| 639E | 3 | 55 |
| | 95 | 55 |
| Mix₂ | | |
| 725 | (97) | 75 |
| 800 | (99) | 90 |
| 843 | 100 | 100 |

## NaOH

B = NaF (236)

| | | |
|---|---|---|
| Mix₁ | | |
| 1005 | 0 | 0 |
| 950 | 4 | 20 |
| 845 | 10 | 40 |
| 670 | 15 | 60 |
| 450 | 18 | 80 |
| Mix₁ + Mix₂ | | |
| 365U | 18 | 90 |
| | 52 | 90 |
| Mix₂ | | |
| 335 | 67 | 95 |
| 310 | 100 | 100 |

B = NaF.—
(*Continued*)

| t, °C | M % A |
|---|---|
| Solid state | |
| A(α) + A(β) | |
| 282 | 20–70 |
| 285 | 80 |
| 290 | 100 |

B = NaCl (236)

| | | |
|---|---|---|
| Mix₁ | | |
| 806 | 0 | 0 |
| 785 | (1) | 10 |
| 750 | (3) | 20 |
| 705 | (6) | 30 |
| 650 | (8) | 40 |
| 575 | (10) | 50 |
| 495 | (11) | 60 |
| 410 | (12) | 70 |
| Mix₁ + Mix₂ | | |
| 360U | 12 | 78 |
| | 49 | 78 |
| Mix₂ | | |
| 350 | 53 | 85 |
| 325 | 74 | 95 |
| 310 | 100 | 100 |
| Solid state | | |
| A(α) + A(β) | | |
| 290 | 100 | |
| 260 | 90 | |
| 175 | 75 | |
| 160 | 10–100 | |

B = NaBr (236)

| | |
|---|---|
| B | |
| 765 | 0 |
| 728 | 10 |
| 683 | 20 |
| 568 | 40 |
| 497 | 50 |
| 420 | 60 |
| 340 | 70 |
| B + A(β) | |
| 260E | 79.5 |
| A(β) + A(α) | |
| 290 | 91 |
| A(α) | |
| 310 | 100 |

B = NaI (236)

| | |
|---|---|
| B | |
| 665 | 0 |
| 620 | 15 |
| 555 | 30 |
| 497 | 40 |
| 425 | 50 |
| B + $B_3A_2$ | |
| 295U | 64 |
| $B_3A_2$ | |
| 285 | 70 |
| 265 | 75 |
| $B_3A_2$ + A(β) | |
| 225E | 80.5 |
| A(β) | |
| 275 | 90 |
| A(β) + A(α) | |
| 290 | 94 |
| A(α) | |
| 310 | 100 |

B = NaI.—
(*Continued*)

| t, °C | M % A |
|---|---|
| Solid state | |
| A(β) | |
| 290 | 100 |

B = $Na_2CO_3$
(171) (A.)

| t, °C | M % B |
|---|---|
| Mix. (?) | |
| 296 | 0 |
| 290 | 1.03 |
| 284.7 | 2.55 |
| 280 | 5.07 |
| 283 | 7.27 |
| 297 | 10.91 |

B = KOH
(111, 171)

| t, °C | Wt. % B |
|---|---|
| Mix.* + liq. | |
| 290 | 0 |
| 278 | 10 |
| 262 | 20 |
| 215 | 40 |
| 184 | 50 |
| 168 | 55 |
| 167 | 60 |
| 185 | 70 |
| 220 | 80 |
| 345 | 100 |

* Mix. A = 97.3 NaOH, 2.55$Na_2CO_3$, 0.15$H_2O$. Mix. B = 83.4KOH, 2.9$K_2CO_3$, 13.7$H_2O$.

B = RbOH (111)
*v.* Fig. 34

## NaF

B = NaCl
(201, 273)

| t, °C | M % A |
|---|---|
| B | |
| 797 | 0 |
| 760 | 10 |
| 724 | 20 |
| B + A | |
| 675E | 34.5 |
| A | |
| 706 | 40 |
| 765 | 50 |
| 820 | 60 |
| 867 | 70 |
| 909 | 80 |
| 950 | 90 |
| 986 | 100 |

B = $NaClO_3$
(78) (A.)

| | |
|---|---|
| B | |
| 255.0 | 0 |
| 254.1 | 0.91 |
| 253.9 | 1.03 |
| 253.5 | 1.61 |

$k_B$ = 10.7 (0.15).

B = NaI (219) (A.)

| t, °C | M % B |
|---|---|
| (?) | |
| 980 | 0 |
| 620* | 80 |
| 675 | 100 |

* Minimum $t_L$.

B = $Na_2SO_4$ (273)

| t, °C | M % A |
|---|---|
| B(α) | |
| 881 | 0 |
| 827 | 10 |
| 780 | 20 |
| B(α) + BA(α) | |
| 743E | 30 |
| BA(α) | |
| 772 | 40 |
| 781 | 50 |
| BA(α) + A | |
| 772E | 60 |
| A | |
| 832 | 70 |
| 986 | 100 |
| Solid state | |
| B(α) + B(β) | |
| 233 | 0–50 |
| BA(α) + BA(β) | |
| 105 | 40–60 |

B = $Na_2CO_3$ (8)

| | |
|---|---|
| B | |
| 854 | 0 |
| 730 | 30 |
| B + A | |
| 690E | 40 |
| A | |
| 743 | 50 |
| 1000 | 100 |

B = $Na_3AlF_6$
(74, 153)

| | |
|---|---|
| B | |
| 999 | 0 |
| 992 | 25 |
| 969 | 55 |
| 933 | 70 |
| 911 | 75 |
| B + Mix. | |
| 886E | 80 \| 78 |
| Mix. | |
| 899 | 82 \| 80 |
| 951 | 91 \| 90 |
| 984 | 100 \| 100 |

B = KF (142)

| | |
|---|---|
| B | |
| 997 | 0 |
| 953 | 10 |
| 907 | 20 |
| 858 | 30 |
| 807 | 40 |
| 757 | 50 |
| B + Mix. | |
| 699E | 82 \| 60 |

### NaF.— (Continued)

B = KF.— (Continued)

| t, °C | M % A |
|---|---|
| Mix. | |
| 737 | (86) 70 |
| 773 | (90) 80 |
| 807 | (95) 90 |
| 837 | 100 100 |

### $NaHF_2$

B = $KHF_2$ (161) (A.)

| B |
|---|
| 227.0 \| 0 |
| 217.5 \| 6.22 |
| 213.0 \| 12.28 |
| 175E(?) \| 23.94 |

### NaCl

B = $NaClO_3$ (78) (A.)

| B |
|---|
| 255.0 \| 0 |
| 254.5 \| 0.53 |
| 254.2 \| 0.87 |
| 253.4 \| 1.56 |

$k_B$ = 10.5 (0.15).

B = NaBr (1, 241)

| Mix. + liq. |
|---|
| 748 \| 0 |
| 746 \| 10 |
| 744.5 \| 20 |
| 744 \| 30 |
| 744.5 \| 40 |
| 747 \| 50 |
| 754 \| 60 |
| 765 \| 70 |
| 777 \| 80 |
| 791 \| 90 |
| 808 \| 100 |

B = NaI (1, 241)

| Mix. | | |
|---|---|---|
| 662 | 0 | 0 |
| 638 | 3 | 10 |
| 615 | 8 | 20 |
| 592 | 15 | 30 |
| Mix. + A | | |
| 578E | 24 | 36 |
| A | | |
| 594 ↓ | | 40 |
| 706 ↓ | | 70 |
| 739 | | 80 |
| 770 | | 90 |
| 808 | | 100 |

B = $Na_2SO_4$ (125, 273)

| B(α) |
|---|
| 881 \| 0 |
| 783 \| 20 |
| 737 \| 30 |
| 690 \| 40 |
| B + A |
| 623E \| 55 |

### $Na_2SO_4$.— (Continued)

B = $Na_2SO_4$ (Continued)

| t, °C | M % A |
|---|---|
| A | |
| 650 | 60 |
| 728 | 80 |
| 797 | 100 |
| Solid state | |
| 233 | 0 |
| 224 | 3–100 |

$k_A$ = 20.4 (5); = 23 (1.0). $k_B$ = 44 (1.0) (221) (A.).

B = $NaNO_2$ (157) (A.)

| Mix. |
|---|
| 281.5 \| 0 |
| 279.0 \| 0.12 |
| 283.5 \| 0.30 |
| 288.5 \| 0.59 |
| 291.0 \| 0.82 |
| 295.0 \| 1.17 |
| 309.0 \| 3.46 |
| 319.0 \| 5.85 |
| 334.5 \| 9.54 |

B = $NaNO_3$ (196) (A.)

| B |
|---|
| 312.0 \| 0 |
| 308.0 \| 3.44 |
| B + A |
| 304.0 E \| 6.82 |
| A |
| 332.0 \| 8.35 |
| 380.5 \| 12.58 |

B = $Na_4P_2O_7$ (63)

| t, °C | M % B |
|---|---|
| A | |
| 778 | 0 |
| 762 | 10 |
| 743 | 20 |
| 710 | 30 |
| 690 | 40 |

B = $Na_2CO_3$ (8)

| t, °C | M % A |
|---|---|
| B | |
| 854 ↓ | 0 |
| 670 ↓ | 50 |
| B + A | |
| 636E | 58.5 |
| A | |
| 665 ↓ | 65 |
| 808 ↓ | 100 |

$k_A$ = 18.0 (1.1). $k_B$ = 30.0 (1.5) (221) (A.).

B = NaCN (256)

| t, °C | M % B | |
|---|---|---|
| Mix. | | |
| 795 | 0 | 0 |
| 776 | 6 | 10 |
| 756 | 13 | 20 |
| 735 | 20 | 30 |
| 713 | 27 | 40 |
| 689 | 37 | 50 |
| 665 | 46 | 60 |

### NaCN.— (Continued)

B = NaCN.— (Continued)

| t, °C | M % B | |
|---|---|---|
| Mix. | | |
| 640 | 56 | 70 |
| 614 | 68 | 80 |
| 587 | 82 | 90 |
| 562.3 | 100 | 100 |

B = $Na_2CrO_4$ (221) (A.)

| A |
|---|
| 802 \| 0 |
| 788 \| 3.55 |
| 782 \| 4.84 |
| 779 \| 5.73 |

$k_A$ = 22 (1.0).

B = KCl (87, 142, 169, 250, 255)

| Mix. + liq. |
|---|
| 798 \| 0 |
| 760 \| 15 |
| 697 \| 30 |
| 660 \| 50 |
| 665 \| 60 |
| 700 \| 80 |
| 775 \| 100 |
| Solid state |
| Unmixing |
| 373 \| 40 |
| 360 \| 21 \| 66 |
| 340 \| 11 \| 81 |

B = $K_2SO_4$* (221) (A.)

| A (?) Mix. |
|---|
| 802 \| 0 |
| 785 \| 2.06 |
| 768 \| 3.99 |
| 756 \| 5.32 |

B = $K_2CO_3$* (220, 221) (A.)

| t, °C | M % A |
|---|---|
| B (?) Mix. | |
| 909 | 0 |
| 892 | 3.39 |
| 858 | 11.02 |
| 825 | 15.95 |
| 810 | 19.09 |
| A (?) Mix. | |
| 763 | 94.68 |
| 774 | 96.72 |
| 789 | 98.39 |
| 802 | 100 |

B = RbCl (215, 278)

| B |
|---|
| 726 \| 0 |
| 642 \| 20 |
| 602 \| 30 |
| B + A |
| 541E \| 45.5 |
| A |
| 565 \| 50 |
| 623 \| 60 |
| 701 ↓ \| 75 |
| 819 ↓ \| 100 |

* Reciprocal salt mixtures.

B = CsCl (278)

| t, °C | M % A |
|---|---|
| B(α) | |
| 646 | 0 |
| 600 | 10 |
| 553 | 20 |
| 505 | 30 |
| B(α) + A | |
| 493E | 34 |
| A | |
| 523 | 40 |
| 580 | 50 |
| 635 | 60 |
| 685 | 70 |
| 730 | 80 |
| 775 | 90 |
| 819 | 100 |
| Solid state | |
| B(α) + B(β) | |
| 451 | 0–100 |

### $NaClO_3$

B = NaBr (78) (A.)

| t, °C | M % B |
|---|---|
| A | |
| 255.0 | 0 |
| 253.5 | 1.36 |
| 252.6 | 2.23 |
| 251.8 | 3.95 |

$k_A$ = 11.1 (0.39).

B = $NaNO_3$ (78) (A.)

| A |
|---|
| 255.0 \| 0 |
| 253.9 \| 1.11 |
| 253.3 \| 1.64 |
| 252.1 \| 2.82 |

$k_A$ = 10.6 (0.33).

B = $Na_2CO_3$ (78) (A.)

| A |
|---|
| 255.0 \| 0 |
| 253.9 \| 1.01 |
| 253.3 \| 1.53 |

$k_A$ = 10.7 (0.15).

B = $Na_2CrO_4$ (78) (A.)

| A |
|---|
| 255.0 \| 0 |
| 254.5 \| 0.50 |
| 254.1 \| 0.81 |
| 252.2 \| 2.61 |

$k_A$ = 11.2 (0.25).

B = KCl* (78) (A.)

| A (?) Mix. |
|---|
| 255.0 \| 0 |
| 253.2 \| 0.93 |
| 252.2 \| 1.43 |

* Reciprocal salt mixtures.

B = $KClO_3$ (78) (A.)

| t, °C | M % B |
|---|---|
| Mix. (?) | |
| 255.0 | 0 |
| 253.8 | 1.20 |
| 252.4 | 2.54 |
| 251.1 | 3.81 |

B = $KNO_3$* (78) (A.)

| A (?) Mix. |
|---|
| 255.0 \| 0 |
| 253.4 \| 0.76 |
| 253.1 \| 0.95 |
| 251.9 \| 1.51 |

* Reciprocal salt mixtures.

B = $CsClO_3$ (78) (A.)

| A |
|---|
| 255.0 \| 0 |
| 254.6 \| 0.39 |
| 253.7 \| 1.15 |

$k_A$ = 11.8 (0.11).

### NaBr

B = NaI (1, 241)

| t, °C | M % A |
|---|---|
| Mix. + liq. | |
| 662 | 0 |
| 653 | 10 |
| 648 | 20 |
| 645 | 30 |
| 648 | 40 |
| 656 | 50 |
| 668 | 60 |
| 684 | 70 |
| 703 | 80 |
| 725 | 90 |
| 748 | 100 |

B = $NaNO_2$ (157) (A.)

| Mix. |
|---|
| 281.5 \| 0 |
| 277.5 \| 0.067 |
| 278.5 \| 0.168 |
| 280 \| 0.34 |
| 282 \| 0.50 |
| 283.5 \| 0.67 |
| 293 \| 1.68 |
| 302 \| 2.72 |
| (307)(?) \| 3.40 |

B = KBr (142)

| Mix. + liq. |
|---|
| 757 \| 0 |
| 730 \| 10 |
| 702 \| 20 |
| 675 \| 30 |
| 655 \| 40 |
| 644 \| 50 |
| 652 \| 60 |
| 675 \| 70 |
| 705 \| 80 |
| 739 \| 90 |
| 768 \| 100 |

### NaI

B = KI (142)

| t, °C | M % A |
|---|---|
| Mix. + liq. | |
| 693 | 0 |
| 627 ↓ | 30 |
| 607 | 40 |
| 592 | 50 |
| 586 | 56 |
| 596 | 70 |
| 613 | 80 |
| 637 | 90 |
| 660 | 100 |

### $Na_2SO_4$

B = $NaNO_3$ (7)

| B |
|---|
| 310 \| 0 |
| B + A |
| 300E \| 5 |
| A |
| 380 \| 10 |
| 515 \| 20 |
| 625 \| 30 |
| Decompn. of B above 600°. | |

B = $Na_2CO_3$ (2)

| Mix. + liq. |
|---|
| 854 \| 0 |
| 843 \| 10 |
| 835 \| 20 |
| 830 \| 30 |
| 827 \| 40 |
| 833 \| 55 |
| 849 \| 70 |
| 870 \| 85 |
| 892 \| 100 |
| Solid state |
| 200 \| 95 |
| 236 \| 100 |

B = $Na_2CrO_4$ (76)

| t, °C | M % A | |
|---|---|---|
| Mix. | | |
| 792 | 0 | 0 |
| 792 | | 10 |
| 795 | (30) | 20 |
| 800 | (42) | 30 |
| 808 | (53) | 40 |
| 819 | (65) | 50 |
| 836 | (75) | 60 |
| 845 | (83) | 70 |
| 858 | (90) | 80 |
| 871 | (95) | 90 |
| 885 | 100 | 100 |
| Solid state | | |
| A(α) + A(β) + B(α) + B(β) | | |
| 413 | 0 | |
| 350 | 18–25 | |
| 300 | 40–47 | |
| 250 | 75–79 | |
| 235 | 100 | |

B = $Na_2MoO_4$ (35)

v. Fig. 35

B = $Na_2WO_4$ (35)

*v.* Fig. 36

B = KCl* (221) (A.)

| *t*, °C | M % A |
|---|---|
| B (?) Mix. | |
| **771** | 0 |
| 758 | 1.68 |
| 745 | 3.25 |
| 737 | 4.42 |
| 720 | 5.96 |
| A (?) Mix. | |
| 812 | 88.54 |
| 828 | 89.56 |
| 846 | 92.62 |
| 862 | 95.26 |
| **890** | 100 |

* Reciprocal salt mixtures.

B = $K_2SO_4$ (166)

*v.* Fig. 37

## $Na_2S_2O_7$

B = $Na_2H_2S_2O_8$ (58) (A.)

| | | |
|---|---|---|
| B | | |
| **185.7** | 0 | |
| 185.1 | 2.44 | |
| 183.2 | 4.21 | |
| B + A | | |
| 183.0E* | 4.71 | |
| A | | |
| 185.0 | 6.92 | |
| 221.5 | 11.80 | |
| 245.0 | 17.95 | |
| 326.5 | 51.90 | |
| 374.2 | 79.00 | |
| 392.7 | 90.80 | |
| **400.9** | 100 | |

* All mixtures give E at 183°.

## $NaNO_2$

B = $NaNO_3$ (46)

| *t*, °C | Wt. % B | |
|---|---|---|
| Mix. | | |
| **284** | 0 | 0 |
| 270 | (5) | 10 |
| 253 | (13) | 20 |
| 236 | (22) | 30 |
| 225 | | 40 |
| 221 | | 50 |
| 231 | (65) | 60 |
| 248 | (77) | 70 |
| 266 | (86) | 80 |
| 287 | (92) | 90 |
| **312** | 100 | 100 |

B = $KNO_2$ (11)

| *t*, °C | M % B |
|---|---|
| Mix. + liq. | |
| **282** | 0 |
| 260 | 10 |
| 228 | 25 |
| 219 | 35 |
| 248 | 50 |
| 322 | 70 |
| **383** | 85 |

B = $KNO_2$.— (*Continued*)

| *t*, °C | M % B |
|---|---|
| Mix. + liq. | |
| **440** | 100 |
| Solid state | |
| A($\alpha$) + A($\beta$) | |
| 160 | 0 |
| 103 | 10 |

## $NaNO_3$

B = $Na_2CO_3$ (7)

| | | |
|---|---|---|
| A | | |
| **310** | 0 | |
| A + B | | |
| 304E | 3 | |
| B | | |
| 465 | 10 | |
| 575 | 20 | |
| 655* | 30 | |

* Decompn. above 600°.

B = $KNO_3$ (45, 60, 112)

| | | |
|---|---|---|
| $Mix_1$ | | |
| **310** | 0 | 0 |
| 290 | (4) | 10 |
| 270 | (10) | 20 |
| 250 | (18) | 30 |
| 228 | (32) | 40 |
| $Mix_1 + Mix_2$ | | |
| 219 | 47 | 47 |
| $Mix_2$ | | |
| 230 | (71) | 60 |
| 254 | (82) | 70 |
| 282 | (89) | 80 |
| 310 | (95) | 90 |
| **336** | 100 | 100 |
| Solid state | | |
| B($\alpha$) + B($\beta$) | | |
| 85 | 50–94 | |
| 100 | 94–96 | |
| 124 | 100 | |

## $NaNH_2$

B = $KNH_2$ (139) (S.)

| | |
|---|---|
| A | |
| **206.4** | 0 |
| 189.5 | 6.4 |
| 155.0 | 14.0 |
| 145.1 | 18.2 |
| 120.5 | 25.1 |
| A + $AB_2$ | |
| 92 | (33) |
| $AB_2$ | |
| 100.3 | 38 |
| 110.5 | 43.2 |
| 118.5 | 54.9 |
| $AB_2$ + B | |
| 120.0U | 64.1 |
| B | |
| 174.0 | 72.0 |
| 231.0 | 82.4 |
| **329.0** | 100 |

## $NaPO_3$

B = $Na_4P_2O_7$ (187)

| *t*, °C | M % B |
|---|---|
| A | |
| **987** | 0 |
| 883 | 10 |
| 730 | 20 |
| A + B (?) | |
| 612E | 25.5 |

B = $NaBO_2$ (134) (A.)

| *t*, °C | M % A |
|---|---|
| B | |
| **966** | 0 |
| 922 | 6.6 |
| 866 | 13.8 |
| (864) (?) | 21.5 |
| BA | |
| (774) (?) | 39.0 |
| 800 | 49.0 |
| (796) (?) | 59.9 |
| (608) (?) | 71.9 |
| A | |
| **610** | 100 |

## $Na_4P_2O_7$

B = $NaBO_2$ (64) (A.)

| | |
|---|---|
| B | |
| **940** | 0 |
| 918 | 7.0 |
| 910 | 9.0 |
| $B_3A_2$ | |
| 932 | 23.0 |
| 952 | 33.0 |
| 960 | 37.5 |
| 960 | 41.0 |
| 950 | 44.0 |
| 930 | 50.0 |
| 850 | 71.5 |
| A | |
| 850 | 71.5 |
| 925 | 89.5 |
| **970** | 100 |

B = $K_4P_2O_7$ (11)

| *t*, °C | M % B |
|---|---|
| Mix. + liq. | |
| **994** | 0 |
| 943 | 10 |
| 905 | 20 |
| 885 | 30 |
| 875 | 40 |
| 892 | 50 |
| 925 | 60 |
| 963 | 70 |
| 1003 | 80 |
| 1047 | 90 |
| **1090** | 100 |
| Solid state | |
| Unmixing | |
| 505* | 50 |
| 500 | 37 55 |
| 450 | 25 67 |
| 375 | 18 75 |

* Probable formation of AB.

B = $K_4P_2O_7$.— (*Continued*)

| *t*, °C | M % B |
|---|---|
| A($\alpha$) + A($\beta$) | |
| 395 | 0 |
| 180 | 4 |
| B($\alpha$) + B($\beta$) | |
| 175 | 90 |
| 275 | 100 |

## $NaAsO_3$

B = $KAsO_3$ (15)

| | | |
|---|---|---|
| Mix. | | |
| **615** | 0 | 0 |
| 563 | (6) | 10 |
| 526 | (10) | 20 |
| 505 | (12) | 30 |
| 496 | 13 | 40 |
| 497 | 50 | 50 |
| 510 | 60 | 60 |
| 530 | 70 | 70 |
| 562 | 80 | 80 |
| 602 | 90 | 90 |
| **650** | 100 | 100 |
| Solid state | | |
| B($\alpha$) + B($\beta$) | | |
| 380 | 90 | |
| 450 | 100 | |

## $Na_3AsO_4$

B = $K_3AsO_4$ (15)

| | | |
|---|---|---|
| Mix. + liq. | | |
| **1260** | 0 | |
| 1212 | 10 | |
| 1178 | 20 | |
| 1160 | 30 | |
| 1156 | 35 | |
| 1185 | 50 | |
| 1210 | 60 | |
| 1236 | 70 | |
| 1260 | 80 | |
| 1285 | 90 | |
| **1310** | 100 | |
| Solid state | | |
| Unmixing | | |
| 464 | 50* | |
| 460 | 34 | 57 |
| 450 | 23 | 70 |
| 440 | 5 | 8 |
| A($\alpha$) + A($\beta$) | | |
| 410 | 0 | |
| 370 | 6–15 | |

* Probable comp. formation.

## $Na_4As_2O_7$

B = $K_4As_2O_7$ (15)

*v.* Fig. 38

## $Na_2CO_3$

B = $Na_2CrO_4$ (220, 221) (A.)

| | |
|---|---|
| A | |
| **860** | 0 |
| 849 | 3.34 |
| 843 | 5.38 |
| 836 | 7.15 |

B = $Na_2CrO_4$.— (*Continued*)

| *t*, °C | M % B |
|---|---|
| A | |
| 826 | 9.51 |
| 820 | 11.55 |

$k_A$ = 32 (1.2).

B = KCl* (221, 222)

| *t*, °C | M % A |
|---|---|
| B (?) Mix. | |
| **771** | 0 |
| 758 | 1.75 |
| 745 | 3.11 |
| 731 | 5.43 |
| A (?) Mix. | |
| 799 | 89 11 |
| 821 | 92.13 |
| 842 | 96.61 |
| **860** | 100 |

* Reciprocal salt mixtures.

B = $K_2CO_3$ (11, 172)

| *t*, °C | M % B |
|---|---|
| Mix. + liq. | |
| **854** | 0 |
| 790 | 10 |
| 740 | 20 |
| 712 | 30 |
| 704 | 40 |
| 715 | 50 |
| 735 | 60 |
| 770 | 70 |
| 810 | 80 |
| 855 | 90 |
| **896** | 100 |
| Solid state | |
| Unmixing | |
| 480 | 36 |
| 490* | 50 |
| 455 | 60 |
| A($\alpha$) + A($\beta$) | |
| 430 | 0 |
| B($\alpha$) + B($\beta$) | |
| 405 | 100 |

* Probable formation of AB.

B = $K_2CrO_4$* (220, 221) (A.)

| | |
|---|---|
| A (?) Mix. | |
| **860** | 0 |
| 839 | 2.82 |
| 831 | 4.17 |
| 811 | 6.48 |

* Reciprocal salt mixtures.

## NaCN

B = KCN (256)

| | | |
|---|---|---|
| $Mix_1$ | | |
| **561.7** | 0 | 0 |
| 548 | 5 | 10 |
| 524 | 14 | 20 |
| 508 | 28 | 30 |

B = KCN.— (*Continued*)

| *t*, °C | M % B | |
|---|---|---|
| $Mix_1$ + $Mix_2$ | | |
| 502 | 40 | 40 |
| $Mix_2$ | | |
| 510 | 60 | 50 |
| 533 | 79 | 60 |
| 555 | 88 | 76 |
| 578 | 94 | 80 |
| 600 | 97 | 90 |
| **622** | 100 | 100 |
| At 260° Mix. → A + B. | | |

## NaCNS

B = KCNS (264)

| *t*, °C | M % A |
|---|---|
| B($\alpha$) | |
| **179** | 0 |
| 160 | 10 |
| B($\alpha$) + B($\beta$) | |
| 142 | 18 |
| B($\beta$) + A | |
| 123.5E | 30 |
| A | |
| 188 | 40 |
| 225 | 50 |
| 251 | 60 |
| 272 | 70 |
| 290 | 80 |
| 307 | 90 |
| **323** | 100 |

At 102° $AB_3$ forms.

## $Na_2CrO_4$

B = $K_2CO_3$* (220, 221) (A.)

| | |
|---|---|
| B (?) Mix. | |
| **909** | 0 |
| 889 | 2.56 |
| 884 | 3.51 |
| 854 | 7.47 |
| 833 | 9.96 |

* Reciprocal salt mixtures.

B = $K_2CrO_4$ (11, 76)

*v.* Fig. 39

## $Na_2MoO_4$

B = $Na_2WO_4$ (35)

*v.* Fig. 41

B = $K_2MoO_4$ (11)

*v.* Fig. 40

## $Na_2WO_4$

B = $K_2WO_4$ (11, 149)

*v.* Fig. 42

## $NaBO_2$

B = $KBO_2$ (134)

| $t$, °C | M % A | |
|---|---|---|
| | Mix$_1$ | |
| **947** | 0 | 0 |
| 935 | 4 | 10 |
| 920 | 10 | 20 |
| 900 | 16 | 30 |
| 875 | 25 | 40 |
| | Mix$_1$ + Mix$_2$ | |
| 850 | 55 | 55 |
| | Mix$_2$ | |
| 865 | 74 | 65 |
| 905 | 88 | 80 |
| 940 | 95 | 90 |
| **966** | 100 | 100 |
| | Solid state | |
| | Unmixing | |
| 553 | 55 | |
| 530 | 46 | 64 |
| 500 | 42 | 69 |

## KOH

B = KF (235)

| | Mix. | |
|---|---|---|
| **857** | 0 | 0 |
| 830 | 4 | 10 |
| 797 | 10 | 20 |
| 758 | 18 | 30 |
| 714 | 24 | 40 |
| 667 | 39 | 50 |
| 617 | 50 | 60 |
| 566 | 60 | 70 |
| 510 | 71 | 80 |
| 450 | 83 | 90 |
| **380** | 100 | 100 |
| | Solid state | |
| | A($\alpha$) + A($\beta$) | |
| 138 | 30 | |
| 153 | 50 | |
| 180 | 70 | |
| 227 | 90 | |
| 265 | 100 | |

B = KCl (235)

*v.* Fig. 43

B = KBr (235)

| | B | |
|---|---|---|
| **760** | 0 | |
| 658 | 10 | |
| 590 | 20 | |
| 513 | 35 | |
| 418 | 50 | |
| 343 | 60 | |
| | B + Mix. | |
| 300E | 79 | 65 |
| | Mix. | |
| 319 | 82 | 70 |
| 350 | 89 | 80 |
| 370 | 96 | 90 |
| **380** | 100 | 100 |
| | Solid state | |
| | A($\alpha$) + A($\beta$) | |
| 195 | 0–93 | |
| 220 | 92–94 | |
| 265 | 100 | |

B = KI (235)

| $t$, °C | M % A | |
|---|---|---|
| | B | |
| **695** | 0 | |
| 655 | 10 | |
| 583 | 25 | |
| 490 | 40 | |
| 379 | 55 | |
| 300 | 65 | |
| | B + A($\beta$) | |
| 250E | 72 | |
| | A($\alpha$) + A($\beta$) | |
| 265 | 74 | |
| | A($\alpha$) | |
| 303 | 80 | |
| 350 | 90 | |
| **380** | 100 | |

B = RbOH (111, 171)

*v.* Fig. 44

## KF

B = KCl (201)

| | B | |
|---|---|---|
| **772** | 0 | |
| 745 | 10 | |
| 692 | 25 | |
| 650 | 35 | |
| | B + A | |
| 605E | 45 | |
| | A | |
| 663 | 55 | |
| 713 | 65 | |
| 760 | 75 | |
| 800 | 85 | |
| **859** | 100 | |

B = KBr (143)

| | B | |
|---|---|---|
| **748** | 0 | |
| 720 | 10 | |
| 682 | 20 | |
| 635 | 30 | |
| | B + A | |
| 580E | 40 | |
| | A | |
| 642 | 50 | |
| 750 | 70 | |
| 826 | 90 | |
| **851** | 100 | |

B = KI (219) (A.)

| $t$, °C | M % B | |
|---|---|---|
| | (?) | |
| **885** | 0 | |
| 580* | 70 | |
| **705** | 100 | |

* Minimum $t_L$.

B = $K_2SO_4$ (128)

| $t$, °C | M % A | |
|---|---|---|
| | B($\alpha$) | |
| **1074** | 0 | |
| 1033 | 10 | |
| 987 | 20 | |
| 939 | 30 | |

B = $K_2SO_4$.— (*Continued*)

| $t$, °C | M % A | |
|---|---|---|
| | B($\alpha$) + BA($\alpha$) | |
| 883E | 42 | |
| | BA($\alpha$) | |
| **887** | 50 | |
| 878 | 60 | |
| 852 | 70 | |
| | BA($\alpha$) + A | |
| 786E | 83 | |
| | A | |
| 820 | 90 | |
| **867** | 100 | |
| | Solid state | |
| | B($\alpha$) + B($\beta$) | |
| 599 | 0-50 | |
| | BA($\alpha$) + BA($\beta$) | |
| 578 | 20-83 | |

B = $KPO_3$ (4)

| $t$, °C | M % B | |
|---|---|---|
| | A | |
| **855** | 0 | |
| 802 | 10 | |
| | A + $A_2B(\alpha)$ | |
| 740E | 17.5 | |
| | $A_2B(\alpha)$ | |
| 774 | 25 | |
| | $A_2B(\alpha)$ + AB($\alpha$) | |
| **793UE** | 33.3 | |
| | AB($\alpha$) | |
| 847 | 40 | |
| **880** | 50 | |
| 845 | 60 | |
| 680 | 75 | |
| | AB($\alpha$) + B | |
| 604E | 82.5 | |
| | B | |
| 685 | 90 | |
| **798** | 100 | |
| | Solid state | |
| | $A_2B(\alpha)$ + $A_2B(\beta)$ | |
| 540 | 0–50 | |
| | AB($\alpha$) + AB($\beta$) | |
| 450 | 34–100 | |

B = $K_3PO_4$ (4)

| | A | |
|---|---|---|
| **855** | 0 | |
| 818 | 10 | |
| | A + B | |
| 766E | 20 | |
| | B | |
| 865 | 30 | |
| 950 | 40 | |
| 1020 | 50 | |
| 1085 | 60 | |
| 1200 | 80 | |
| **1340** | 100 | |

At 700° there is a transformation of an unstable undetermined comp.

B = $K_4P_2O_7$ (4)

| | A | |
|---|---|---|
| **855** | 0 | |
| 793 | 10 | |

B = $K_4P_2O_7$.— (*Continued*)

| $t$, °C | M % B | |
|---|---|---|
| | A + B | |
| 730E | 20 | |
| | B | |
| 792 | 30 | |
| 850 | 40 | |
| 955 | 60 | |
| 997 | 70 | |
| 1050 | 85 | |
| **1088** | 100 | |

B = $K_2CO_3$ (8)

| $t$, °C | M % A | |
|---|---|---|
| | B | |
| **896** | 0 | |
| 858 | 10 | |
| 815 | 20 | |
| 770 | 30 | |
| 720 | 40 | |
| | B + BA | |
| 688E | 46 | |
| | BA | |
| **688** | 50 | |
| 686 | 55 | |
| | BA + A | |
| 682E | 61.5 | |
| | A | |
| 725 | 70 | |
| 775 | 80 | |
| 817 | 90 | |
| **855** | 100 | |

## KCl

B = KBr (17, 264)

| | Mix. + liq. | |
|---|---|---|
| **740** | 0 | |
| 736 | 20 | |
| 735 | 30 | |
| 734 | 40 | |
| 736 | 50 | |
| 738 | 60 | |
| 744 | 70 | |
| 752 | 80 | |
| 762 | 90 | |
| **771** | 100 | |

B = KI (17, 264)

| $t$, °C | M % B | |
|---|---|---|
| | Mix$_1$ | |
| **780** | 0 | 0 |
| 746 | 7 | 10 |
| 705 | 14 | 20 |
| 653 | 24 | 30 |
| 600 | 37 | 40 |
| 586 | 47 | 50 |
| | Mix$_1$ + Mix$_2$ | |
| 584 | 55 | 55 |
| | Mix$_2$ | |
| 587 | 66 | 60 |
| 599 | 74 | 70 |
| 638 | 86 | 80 |
| 668 | 96 | 90 |
| **680** | 100 | 100 |

B = KI.— (*Continued*)

| $t$, °C | M % B | |
|---|---|---|
| | Solid state | |
| | Unmixing | |
| 595 | 10 | |
| 577 | 20 | |
| 547 | 30 | |
| 512 | 40 | |
| 496 | 55 | |
| 498 | 60 | |
| 505 | 70 | |
| 512 | 80 | |

B = $K_2SO_4$ (124)

| $t$, °C | M % A | |
|---|---|---|
| | B($\alpha$) | |
| **1074** | 0 | |
| 1005 | 10 | |
| 882 | 25 | |
| 720 | 50 | |
| | B + A | |
| 690E | 58 | |
| | A | |
| 715 | 70 | |
| 735 | 80 | |
| 753 | 90 | |
| **778** | 100 | |
| | Solid state | |
| | B($\alpha$) + B($\beta$) | |
| 587 | 0–70 | |

$k_A$ = 27.0 (1.0) (221) (A.).

B = $KNO_3$ (200) (A.)

| | B | |
|---|---|---|
| **344** | 0 | |
| 343 | 1.41 | |
| 341 | 3.14 | |
| 336 | 6.23 | |
| | B + A | |
| 331.5E | 7.44 | |
| | A | |
| 339 | 9.08 | |
| 357 | 13.25 | |
| 371 | 16.17 | |

B = $KPO_3$ (3)

| $t$, °C | M % B | |
|---|---|---|
| | Mix$_1$ | |
| **774** | 0 | 0 |
| 754 | (2) | 10 |
| 740 | (3) | 20 |
| 735 | (3) | 30 |
| 724 | (4) | 40 |
| 708 | (5) | 50 |
| 683 | (7) | 60 |
| 654 | (10) | 70 |
| | Mix$_1$ + Mix$_2$ | |
| 620E | 13 | 80 |
| | 95 | 80 |
| | Mix$_2$ | |
| 705 | (97) | 90 |
| **798** | 100 | 100 |

B = $K_3PO_4$ (3)

| $t$, °C | M % B | |
|---|---|---|
| | A | |
| **774** | 0 | |
| 755 | 10 | |
| | A + B | |
| 720E | 15 | |
| | B | |
| 795 | 25 | |
| 900 | 40 | |
| 975* | 50 | |
| **1340** | 100 | |

* Sublimation above 1100°.

B = $K_4P_2O_7$ (3)

| | A | |
|---|---|---|
| **774** | 0 | |
| 748 | 10 | |
| | A + B | |
| 735E | 15 | |
| | B | |
| 810 | 25 | |
| 895 | 40 | |
| 945 | 50 | |
| 980 | 60 | |
| 1005 | 70 | |
| 1045 | 85 | |
| **1090** | 100 | |

B = $K_2CO_3$ (8)

| $t$, °C | M % A | |
|---|---|---|
| | B | |
| **896** | 0 | |
| 860 | 10 | |
| 825 | 20 | |
| 785 | 30 | |
| 745 | 40 | |
| 704 | 50 | |
| | B + A | |
| 636E | 65 | |
| | A | |
| 656 | 70 | |
| **774** | 100 | |

B (220, 221) (A.)

| | | |
|---|---|---|
| **909** | 0 | |
| 895 | 4.07 | |
| 878 | 9.52 | |
| 870 | 11.90 | |
| 855 | 15.54 | |
| 846 | 18.35 | |

$k_A$ = 25 (1.2.)

B = KCN (256)

| $t$, °C | M % B | |
|---|---|---|
| | Mix. | |
| **775** | 0 | 0 |
| 753 | 6 | 10 |
| 737 | 12 | 20 |
| 720 | 20 | 30 |
| 703 | 28 | 40 |
| 687 | 36 | 50 |
| 674 | 44 | 60 |
| 660 | 54 | 70 |
| 647 | 65 | 80 |
| 635 | 77 | 90 |
| **622** | 100 | 100 |

B = $K_2CrO_4$ (277)

| $t$, °C | M % B |
|---|---|
| A | |
| **790** | 0 |
| 745 | 10 |
| 703 | 20 |
| 665 | 30 |
| A + B($\beta$) | |
| 656E | 32.5 |
| B($\beta$) + B($\alpha$) | |
| 673 | 37 |
| B($\alpha$) | |
| 742 | 50 |
| 805 | 60 |
| 860 | 70 |
| 917 | 80 |
| 957 | 90 |
| **984** | 100 |

$k_A$ = 25.0 (1.2) (221) (A.).

B = $K_2Cr_2O_7$ (277)

| $t$, °C | M % A |
|---|---|
| Mix. + liq. | |
| **395** | 0 |
| 377 | 10 |
| 370 | 20 |
| Mix. + A | |
| 366E | 28 |
| A | |
| 380 | 30 |
| 443 | 40 |
| **510** | 50 |
| 578 | 60 |
| 640 | 70 |
| 688 | 80 |
| 738 | 90 |
| **790** | 100 |

B = RbCl (278)

| Mix. | | |
|---|---|---|
| **726** | 0 | 0 |
| 729 | 22 | 10 |
| 732 | 40 | 20 |
| 735 | 52 | 30 |
| 739 | 62 | 40 |
| 743 | 70 | 50 |
| 749 | 77 | 60 |
| 756 | 84 | 70 |
| 765 | 90 | 80 |
| 776 | 96 | 90 |
| **790** | 100 | 100 |

B = CsCl (278)

| $Mix_1$ | | |
|---|---|---|
| **646** | 0 | 0 |
| 635 | 5 | 10 |
| 625 | 12 | 20 |
| 620 | 18 | 30 |
| $Mix_1$ + $Mix_2$ | | |
| 616 | 34.5 | 34.5 |
| $Mix_2$ | | |
| 622 | 45 | 40 |
| 635 | 56 | 50 |
| 655 | 65 | 60 |
| 685 | 75 | 70 |
| 720 | 85 | 80 |
| 755 | 93 | 90 |
| **790** | 100 | 100 |

B = CsCl.— (*Continued*)

| $t$, °C | M % A |
|---|---|
| Solid state | |
| B($\alpha$) + B($\beta$) | |
| 456 | 0 |
| 447 | 5 |
| 440 | 10 |

## KBr

B = KI (17, 264)

| $Mix_1$ | | |
|---|---|---|
| **748** | 0 | 0 |
| 722 | 7 | 10 |
| 688 | 15 | 20 |
| 640 | 26 | 30 |
| 605 | 36 | 40 |
| $Mix_1$ + $Mix_2$ | | |
| 589 | 50 | 50 |
| $Mix_2$ | | |
| 608 | 67 | 60 |
| 632 | 79 | 70 |
| 653 | 83 | 80 |
| 668 | 94 | 90 |
| **680** | 100 | 100 |

## KI

B = $K_2SO_4$ (219) (A.)

| $t$, °C | M % B |
|---|---|
| (?) | |
| **705** | 0 |
| 670* | 13 |
| **1050** | 100 |

* Minimum $t_L$.

## $K_2SO_4$

B = $KNO_3$ (10) (A.)

| $t$, °C | M % A |
|---|---|
| B($\alpha$) | |
| **336** | 0 |
| B($\alpha$) + A | |
| 332E | 3 |
| A | |
| 410 | 5 |
| 530 | 10 |
| 665* | 20 |
| **1066** | 100 |
| Solid state | |
| B($\alpha$) + B($\beta$) | |
| 124 | 0–52 |

* Decomp. at higher temps.

B = $K_2CO_3$ (2)

| Mix. + liq. | |
|---|---|
| **896** | 0 |
| 903 | 10 |
| 912 | 20 |
| 922 | 30 |
| 933 | 40 |
| 946 | 50 |
| 966 | 60 |
| 992 | 70 |
| 1020 | 80 |
| 1045 | 90 |
| **1066** | 100 |

B = $K_2CO_3$.— (*Continued*)

| $t$, °C | M % A |
|---|---|
| Solid state | |
| A($\alpha$) + A($\beta$) | |
| 635 | 70 |
| 608 | 80 |
| 592 | 90 |
| 583 | 100 |

B = $K_2CrO_4$ (93) (A.)

| Mix. + liq. | |
|---|---|
| **978** | 0 |
| 985 | 20 |
| 1000 | 40 |
| 1010 | 50 |
| 1025 | 60 |
| 1045 | 80 |
| **1066** | 100 |
| Solid state | |
| Transition curve | |
| A($\alpha$) + B($\alpha$) to A($\beta$) + B($\beta$) | |
| 666 | 0 |
| 655 | 20 |
| 640 | 40 |
| 625 | 60 |
| 602 | 80 |
| 585 | 100 |

B = $K_2MoO_4$ (5)

| Mix. + liq. | |
|---|---|
| **926** | 0 |
| 921 | 15 |
| 920 | 25 |
| 926 | 40 |
| 940 | 50 |
| 961 | 60 |
| 985 | 70 |
| 1024 | 85 |
| **1066** | 100 |
| Solid state | |
| A($\alpha$) + A($\beta$) | |
| 462 | 30 |
| 503 | 50 |
| 555 | 80 |
| 583 | 100 |
| B($\alpha$) + B($\beta$) | |
| 475 | 0 |
| 460 | 7 |

B = $K_2WO_4$ (6)

| Mix. + liq. | |
|---|---|
| **894** | 0 |
| 888 | 10 |
| 884 | 20 |
| 895 | 40 |
| 912 | 50 |
| 935 | 60 |
| 993 | 80 |
| **1065** | 100 |
| Solid state | |
| A($\alpha$) + A($\beta$) | |
| 483 ↓ | 50 |
| 583 ↓ | 100 |
| B($\alpha$) + B($\beta$) | |
| 575 | 0 |
| 525 | 14 |

## $K_2S_2O_7$

B = $K_2H_2S_2O_8$ (58) (A.)

| $t$, °C | M % A |
|---|---|
| B | |
| **213.8** | 0 |
| 213.2 | 1.65 |
| 212.0 | 4.97 |
| 211.5 | 9.14 |
| B + A($\gamma$) | |
| 201.3E* | 12.42 |
| A($\gamma$) | |
| 202.5 | 14.53 |
| 212.6 | 17.28 |
| 220.0 | 21.66 |
| 224.0 | 25.15 |
| 223.6 | 26.40 |
| A($\beta$) | |
| 236.5 | 32.80 |
| 254.0 | 39.97 |
| 264.5 | 45.34 |
| 285.0 | 55.36 |
| 308.2 | 69.60 |
| A($\alpha$) | |
| 328.0 | 78.82 |
| 380.0 | 92.00 |
| 401.7 | 97.19 |
| **414.2** | 100 |

* All mixtures give E at 201°.

## $KNO_2$

B = $KNO_3$ (158)

| Mix. + liq. | |
|---|---|
| **336** | 0 |
| 323 | 10 |
| 320 | 20 |
| 328 | 30 |
| 353 | 50 |
| 386 | 70 |
| 421 | 90 |
| **(440)** | 100 |
| Solid state | |
| B($\alpha$) + B($\beta$) | |
| 120 | 0 |
| 95 | 10 |
| 90 | 15 |

## $KNO_3$

B = $K_2CO_3$ (7)

| $t$, °C | M % B |
|---|---|
| A($\alpha$) | |
| **336** | 0 |
| A($\alpha$) + B | |
| 326E | 4 |
| B | |
| 430 | 10 |
| 545 | 20 |
| 630 | 30 |
| 700* | 42 |
| **(895)** | 100 |
| Solid state | |
| A($\alpha$) + A($\beta$) | |
| 124 | 0–42 |

* A decomposes above 700°.

B = $K_2CrO_4$ (99) (A.)

| $t$, °C | M % A |
|---|---|
| B | |
| **971** | 0 |
| B + A | |
| 295E | 98 |
| A | |
| **320** | 100 |

## $KPO_3$

B = $K_4P_2O_7$ (187)

| $Mix_1$ | | |
|---|---|---|
| **823** | 0 | 0 |
| 707 | (6) | 10 |
| $Mix_1$ + $Mix_2$ | | |
| 615E | 10 | 19 |
| | 61 | 19 |
| $Mix_2$ | | |
| 700 | (65) | 30 |
| 810 | (72) | 40 |
| 890 | (79) | 50 |
| 955 | (85) | 60 |
| 1035 | (93) | 80 |
| **1092** | 100 | 100 |

B = $KBO_3$ (134) (A.)

| B | |
|---|---|
| **947** | 0 |
| 900 | 10 |
| 825 | 20 |
| B + BA | |
| 770E | 23 |
| BA | |
| 835 | 30 |
| 875 | 40 |
| **885** | 50 |
| 860 | 55 |
| BA + A | |
| 680E | 86 |
| A | |
| 725 | 90 |
| **810** | 100 |

## $K_2CO_3$

B = $K_2CrO_4$ (220, 221) (A.)

| $t$, °C | M % B |
|---|---|
| A | |
| **909** | 0 |
| 903 | 2.35 |
| 895 | 5.94 |
| 886 | 9.33 |
| 879 | 12.20 |

## KCN

B = KCNO (148) (A.)

| A + B | |
|---|---|
| 282E | 82.44 |

## KCNS

B = RbCNS (264)

v. Fig. 45

## $K_2CrO_4$

B = $K_2Cr_2O_7$ (2, 93)

| $t$, °C | M % B |
|---|---|
| A($\alpha$) | |
| **971** | 0 |
| 905 | 30 |
| 798 | 60 |
| A($\alpha$) + A($\beta$) | |
| 666 | 81 |
| A($\beta$) | |
| 555 | 90 |
| A($\beta$) + B | |
| 393E | >99 |
| B | |
| **396** | 100 |

B = $K_2MoO_4$ (6)

| $t$, °C | M % A |
|---|---|
| Mix. + liq. | |
| **926** | 0 |
| 925 | 10 |
| 925 | 20 |
| 926 | 30 |
| 929 | 40 |
| 935 | 50 |
| 942 | 60 |
| 950 | 70 |
| 958 | 80 |
| 969 | 90 |
| **978** | 100 |
| Solid state | |
| A($\alpha$) + A($\beta$) | |
| 470 | 35 |
| 560 | 60 |
| 620 | 80 |
| 666 | 100 |
| B($\alpha$) + B($\beta$) | |
| 475 | 0 |
| 465 | 5 |

B = $K_2WO_4$ (6)

| Mix. + liq. | |
|---|---|
| **894** | 0 |
| 898 | 20 |
| 907 | 40 |
| 923 | 60 |
| 945 | 80 |
| **978** | 100 |
| Solid state | |
| A($\alpha$) + A($\beta$) | |
| 490 ↓ | 40 |
| 666 ↓ | 100 |
| B($\alpha$) + B($\beta$) | |
| 595 | 0 |
| 530 | 10 |

## $K_2Cr_2O_7$

B = $K_2Mo_2O_7$ (6)

| $t$, °C | M % B |
|---|---|
| Mix. + liq. | |
| **398** | 0 |
| 410 | 20 |
| 424 | 40 |
| 440 | 60 |
| 460 | 80 |
| **484** | 100 |

$K_2Cr_2O_7$.—(*Continued*)

B = $K_2W_2O_7$ (6)

| *t*, °C | M % B |
|---|---|
| Mix. + liq. | |
| **398** | 0 |
| 390 | 10 |
| 384 | 15 |
| 385 | 20 |
| 401 | 30 |
| 446 | 50 |
| 486 | 70 |
| 518 | 85 |
| **555** | 100 |

$K_2MoO_4$

B = $K_2WO_4$ (6)

| | |
|---|---|
| Mix. + liq. | |
| **926** | 0 |
| 920 | 20 |
| 913 | 40 |
| 901 | 60 |

$K_2WO_4$.—(*Continued*)

| *t*, °C | M % B |
|---|---|
| Mix. + liq. | |
| 896 | 80 |
| **894** | 100 |
| Solid state | |
| A($\alpha$) + A($\beta$) | |
| 475 | 0–16 |
| B($\alpha$) + B($\beta$) | |
| 540 | 75 |
| 575 | 100 |

$K_2Mo_2O_7$

B = $K_2W_2O_7$ (6)

| | |
|---|---|
| Mix. + liq. | |
| **484** | 0 |
| 500 | 20 |
| 510 | 40 |
| 522 | 60 |
| 538 | 80 |
| **555** | 100 |

RbCl

B = CsCl (278)

| *t*, °C | M % A |
|---|---|
| Mix. | |
| **646** | 0 |
| 640 | 5 |
| 635 | 15 |
| 640 | 40 |
| 645 | 47 |
| 658 | 63 |
| 670 | 73 |
| 684 | 82 |
| 699 | 89 |
| 715 | 96 |
| **726** | 100 |
| Solid state | |
| B($\alpha$) + B($\beta$) | |
| 452 | 0 |
| 442 | 5 |
| 433 | 10 |

## THREE-COMPONENT SYSTEMS

Standard Arrangement (*v.* Vol. III, p. viii)

A = $NH_4NO_3$; B = $NH_4Cl$; C = $LiNO_3$ (196) (A.)

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| A/C = 96.30/3.70 | | | |
| A($\delta$) | | | |
| 163.5 | 96.30 | 0 | 3.70 |
| 147.0 | 90.73 | 5.79 | 3.48 |
| 135.4 | 87.26 | 9.39 | 3.35 |
| A($\gamma$) | | | |
| 118.1 | 81.07 | 15.82 | 3.11 |
| 111.3 | 77.28 | 19.76 | 2.96 |
| 98.8 | 72.17 | 25.06 | 2.77 |
| 92.6 | 70.01 | 27.31 | 2.68 |
| B | | | |
| 98.0 | 68.26 | 29.12 | 2.62 |
| 105.0 | 65.82 | 31.66 | 2.52 |
| 112.5 | 63.79 | 33.76 | 2.45 |
| A/C = 94.25/5.75 | | | |
| A($\delta$) | | | |
| 154.0 | 94.25 | 0 | 5.75 |
| 148.7 | 90.39 | 4.10 | 5.51 |
| 140.3 | 85.17 | 9.63 | 5.20 |
| 137.3 | 83.09 | 11.84 | 5.07 |
| 132.0 | 79.23 | 15.94 | 4.83 |
| 130.5 | 78.38 | 16.84 | 4.78 |
| B | | | |
| 137.0 | 76.28 | 19.07 | 4.65 |
| 154.0 | 73.91 | 21.58 | 4.51 |
| A/C = 92.99/7.01 | | | |
| A($\delta$) | | | |
| 158.9 | 92.99 | 0 | 7.01 |
| 147.5 | 88.49 | 4.84 | 6.67 |
| 128.0 | 83.42 | 10.29 | 6.29 |
| A($\gamma$) | | | |
| 117.0 | 80.14 | 13.81 | 6.05 |
| 106.8 | 75.37 | 18.94 | 5.69 |
| 98.0 | 71.77 | 22.82 | 5.41 |
| 92.9 | 69.48 | 25.28 | 5.24 |

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| A/C = 92.99/7.01 | | | |
| B | | | |
| 94.0 | 67.51 | 27.40 | 5.09 |
| 101.8 | 64.16 | 31.00 | 4.84 |
| 106.8 | 61.53 | 33.83 | 4.64 |
| 125.7 | 56.32 | 39.43 | 4.25 |
| 140.0 | 53.24 | 42.51 | 4.01 |
| A/C = 89.32/10.68 | | | |
| A($\delta$) | | | |
| 153.5 | 89.32 | 0 | 10.68 |
| 147.0 | 87.62 | 1.90 | 10.48 |
| 138.5 | 84.75 | 5.12 | 10.13 |
| 129.3 | 82.19 | 7.98 | 9.83 |
| A($\gamma$) | | | |
| 120.7 | 79.54 | 10.95 | 9.51 |
| 113.6 | 76.73 | 14.10 | 9.17 |
| 98.0 | 70.38 | 21.21 | 8.41 |
| 89.3 | 67.04 | 24.94 | 8.02 |
| B | | | |
| 88.2 | 66.10 | 26.00 | 7.90 |
| 92.8 | 64.67 | 27.60 | 7.73 |
| 97.0 | 62.34 | 30.21 | 7.45 |
| 109.3 | 57.97 | 35.10 | 6.93 |
| A/C = 88.59/11.41 | | | |
| A($\delta$) | | | |
| 134.3 | 88.59 | 0 | 11.41 |
| 131.8 | 86.65 | 2.19 | 11.16 |
| 129.4 | 84.73 | 4.35 | 10.92 |
| 123.9 | 81.47 | 8.03 | 10.50 |
| A($\gamma$) | | | |
| 118.8 | 78.17 | 11.75 | 10.07 |
| 116.2 | 76.73 | 13.39 | 9.88 |
| LiCl | | | |
| 121.8 | 75.30 | 15.00 | 9.70 |
| 130.7 | 74.01 | 16.46 | 9.53 |
| 149.0 | 71.57 | 19.21 | 9.22 |
| 157.0 | 70.51 | 20.53 | 8.96 |

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| A/C = 83.01/16.99 | | | |
| A($\gamma$) | | | |
| 121.0 | 83.01 | 0 | 16.99 |
| 118.3 | 81.57 | 1.74 | 16.69 |
| 112.1 | 77.56 | 6.58 | 15.86 |
| 108.0 | 75.02 | 9.63 | 15.35 |
| 106.0 | 73.88 | 11.00 | 15.12 |
| B | | | |
| 109.0 | 72.75 | 12.36 | 14.89 |
| 119.0 | 71.64 | 13.70 | 14.66 |
| 129.8 | 70.21 | 15.43 | 14.36 |
| 138.0 | 68.79 | 17.14 | 14.07 |
| A/C = 77.52/22.48 | | | |
| A($\gamma$) | | | |
| 108.0 | 77.52 | 0 | 22.48 |
| 105.1 | 75.41 | 2.73 | 21.86 |
| 102.5 | 73.44 | 5.27 | 21.29 |
| 99.8 | 71.50 | 7.78 | 20.72 |
| 96.5 | 69.58 | 10.25 | 20.17 |
| B | | | |
| 98.0 | 69.16 | 10.79 | 20.05 |
| 103.8 | 68.43 | 11.74 | 19.83 |
| 118.8 | 66.67 | 14.01 | 19.32 |
| 136.0 | 64.93 | 16.25 | 18.82 |
| A/C = 72.12/27.88 | | | |
| A($\gamma$) | | | |
| 97.0 | 72.12 | 0 | 27.88 |
| 96.1 | 70.68 | 2.00 | 27.32 |
| 91.0 | 69.26 | 3.98 | 26.76 |
| 88.0 | 67.95 | 5.79 | 26.26 |
| 86.2 | 66.65 | 7.59 | 25.76 |
| B | | | |
| 89.5 | 65.17 | 9.64 | 25.19 |
| 101.2 | 64.00 | 11.26 | 24.74 |
| 118.0 | 62.18 | 13.79 | 24.03 |
| 141.1 | 59.18 | 17.95 | 22.87 |
| 155.5 | 57.79 | 19.87 | 22.34 |
| A/C = 66.80/33.20 | | | |
| C | | | |
| 110.0 | 66.80 | 0 | 33.20 |
| 107.8 | 65.76 | 1.56 | 32.68 |
| 101.0 | 62.78 | 6.03 | 31.19 |
| 97.7 | 61.51 | 8.34 | 30.15 |
| B | | | |
| 98.3 | 59.60 | 10.78 | 29.62 |
| 112.0 | 58.10 | 13.03 | 28.87 |
| 140.0 | 54.89 | 17.84 | 27.27 |
| 150.0 | 53.78 | 19.50 | 26.72 |
| A/C = 64.18/35.82 | | | |
| C | | | |
| 116.0 | 64.18 | 0 | 35.82 |
| 108.7 | 61.38 | 4.35 | 34.27 |
| 106.2 | 59.88 | 6.69 | 33.43 |
| LiCl | | | |
| 103.7 | 58.92 | 8.19 | 32.89 |
| 104.0 | 58.48 | 8.86 | 32.66 |
| 102.5 | 57.71 | 10.08 | 32.21 |
| 101.8 | 57.03 | 11.14 | 31.83 |
| B | | | |
| 109.3 | 56.09 | 12.60 | 31.31 |
| 123.0 | 54.08 | 15.73 | 30.19 |
| 129.3 | 53.26 | 17.02 | 29.72 |

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| A/C = 61.56/38.44 | | | |
| C | | | |
| 124.7 | 61.56 | 0 | 38.44 |
| 119.5 | 59.58 | 3.23 | 37.19 |
| 112.3 | 57.21 | 7.07 | 35.72 |
| 110.0 | 56.54 | 8.16 | 35.30 |
| LiCl | | | |
| 110.0 | 56.21 | 8.70 | 35.09 |
| 109.0 | 54.97 | 10.71 | 34.32 |
| 109.0 | 53.75 | 12.69 | 33.56 |
| B | | | |
| 113.3 | 53.11 | 13.74 | 33.15 |
| 115.0 | 52.69 | 14.41 | 32.90 |
| 134.0 | 50.80 | 17.48 | 31.72 |
| A/C = 56.40/43.60 | | | |
| C | | | |
| 137.0 | 56.40 | 0 | 43.60 |
| 132.3 | 53.90 | 4.44 | 41.66 |
| 128.7 | 52.06 | 7.70 | 40.24 |
| 126.7 | 50.71 | 10.10 | 39.19 |
| LiCl | | | |
| 125.5 | 49.88 | 11.56 | 38.56 |
| 123.7 | 49.07 | 13.00 | 37.93 |
| 120.7 | 48.34 | 14.30 | 37.36 |
| B | | | |
| 122.3 | 47.54 | 15.71 | 36.75 |
| 129.0 | 46.89 | 16.86 | 36.25 |
| 142.0 | 45.40 | 19.51 | 35.09 |

A = $NH_4NO_3$; B = $NH_4Cl$; C = NaCl (196) (A.)

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| A/B = 97.31/2.69 | | | |
| A | | | |
| 165.2 | 97.31 | 2.69 | 0 |
| B | | | |
| 128.3 | 86.77 | 2.39 | 10.81 |
| 133.1 | 85.05 | 2.34 | 12.61 |
| 135.7 | 84.03 | 2.31 | 13.64 |
| 145.1 | 80.87 | 2.22 | 16.91 |
| A/B = 94.00/6.00 | | | |
| A | | | |
| 164.0 | 94.00 | 6.00 | 0 |
| 148.8 | 91.50 | 5.84 | 2.66 |
| 137.5 | 89.03 | 5.68 | 5.29 |
| A + B | | | |
| 128.8E | 86.59 | 5.53 | 7.88 |
| B | | | |
| 135.8 | 84.19 | 5.37 | 10.44 |
| 144.9 | 81.81 | 5.22 | 12.97 |
| 156.2 | 79.47 | 5.07 | 15.46 |
| A/B = 89.98/10.02 | | | |
| A | | | |
| 155.4 | 89.98 | 10.02 | 0 |
| 142.4 | 87.63 | 9.74 | 2.63 |
| 131.4 | 85.30 | 9.48 | 5.22 |
| A + B | | | |
| 130.0E | (?) | (?) | (?) |
| B | | | |
| 138.0 | 82.98 | 9.22 | 7.79 |
| 144.0 | 81.83 | 9.11 | 9.06 |
| 155.7 | 79.59 | 8.84 | 11.57 |
| 163.0 | 78.45 | 8.73 | 12.82 |

**A = $NH_4NO_3$; B = $NH_4Cl$; C = $NaNO_3$ (163) (A.)**

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| A/B = 82.91/17.09 | | | |
| A + B | | | |
| 141.0E | 82.91 | 17.09 | 0 |
| B | | | |
| 138.1* | 81.43 | 16.79 | 1.78 |
| 135.7† | 79.65 | 16.42 | 3.93 |
| 133.0‡ | 77.87 | 16.05 | 6.08 |
| 133.0§ | 76.70 | 15.81 | 9.49 |
| 134.5‖ | 73.95 | 15.25 | 10.80 |
| 134.7‖ | 70.22 | 14.48 | 15.30 |
| 134.0‖ | 67.08 | 13.82 | 19.10 |
| 133.4 | 65.06 | 13.40 | 21.54 |
| NaCl | | | |
| 133.5 | 64.52 | 13.30 | 22.18 |
| 140.4 | 62.41 | 12.86 | 24.73 |
| 147.8 | 60.13 | 12.40 | 27.47 |
| 165.4 | 56.02 | 11.53 | 32.45 |
| A/C = 80.85/19.15 | | | |
| A + C | | | |
| 121.0E | 80.85 | 0 | 19.15 |
| A | | | |
| 117.5 | 78.42 | 3.00 | 18.58 |
| 114.2¶ | 76.04 | 5.94 | 18.02 |
| A + B + C | | | |
| 112.5E | 74.76 | 7.53 | 17.71 |
| B | | | |
| 122.5¶ | 72.85 | 9.88 | 17.27 |
| 131.5¶ | 70.40 | 12.92 | 16.68 |
| 139.5 | 67.03 | 17.09 | 15.88 |
| 148.5 | 65.34 | 19.18 | 15.48 |
| 159.5 | 63.80 | 21.10 | 15.10 |

* This mixture gives E(A + B) at 137.0°C.
† At 132.2°C.
‡ At 129.4°C.
§ at 127.6°C.
‖ Ternary E(A + B + C) at 112.2°C.
¶ This mixture gives ternary E(A + B + C) at 112.5°C.

**A = $NH_4NO_3$; B = $NH_4Cl$; C = KCl (200) (A.)**

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| A/B = 97.36/2.64 | | | |
| A | | | |
| 165.3 | 97.36 | 2.64 | 0 |
| 155.7 | 94.04 | 2.54 | 3.42 |
| 147.1 | 90.91 | 2.47 | 6.62 |
| 138.1 | 88.00 | 2.39 | 9.61 |
| Mix. ($NH_4NO_3$ + $KNO_3$) | | | |
| 134.7 | 86.54 | 2.36 | 11.10 |
| B | | | |
| 142.1* | 85.23 | 2.31 | 12.46 |
| 155.0† | 84.40 | 2.29 | 13.31 |
| 165.7‡ | 83.90 | 2.28 | 13.82 |
| A/B = 94.13/5.87 | | | |
| A | | | |
| 159.3 | 94.13 | 5.87 | 0 |
| 150.0 | 90.94 | 5.68 | 3.38 |
| 140.9 | 87.96 | 5.47 | 6.57 |
| 137.2 | 86.52 | 5.41 | 8.07 |
| B | | | |
| 135.1 | 85.45§ | 5.33 | 9.22 |
| 137.4 | 85.15 | 5.31 | 9.54 |
| 147.2 | 84.46 | 5.27 | 10.27 |
| 160.1 | 83.30 | 5.19 | 11.51 |
| 168.0 | 82.50 | 5.15 | 12.35 |
| A/B = 89.88/10.12 | | | |
| A | | | |
| 152.8 | 89.88 | 10.12 | 0 |
| 146.3 | 87.60 | 9.86 | 2.54 |
| 139.5 | 85.44 | 9.63 | 4.93 |
| B | | | |
| 146.6‖ | 83.58 | 9.41 | 7.01 |
| 158.1¶ | 82.70 | 9.34 | 7.96 |
| 166.8** | 82.00 | 9.24 | 8.76 |
| 177.0†† | 81.24 | 9.15 | 9.61 |
| A/B = 86.42/13.58 | | | |
| A | | | |
| 147.2 | 86.42 | 13.58 | 0 |
| 142.0 | 84.69 | 13.31 | 2.00 |
| 139.6 | 83.86 | 13.17 | 2.97 |
| B | | | |
| 144.8‡‡ | 83.03 | 13.04 | 3.93 |
| 148.2§§ | 82.62 | 12.98 | 4.40 |
| 158.7‖‖ | 81.83 | 12.85 | 5.32 |
| 165.5¶¶ | 81.43 | 12.79 | 5.78 |
| A/B = 85.74/14.26 | | | |
| A | | | |
| 146.3 | 85.74 | 14.26 | 0 |
| 141.9 | 81.63 | 13.59 | 4.78 |
| 137.2 | 77.90 | 12.96 | 9.14 |
| Mix. (A + C) | | | |
| 135.8 | 76.17 | 12.68 | 11.15 |
| 139.1 | 74.51 | 12.39 | 13.10 |
| 146.1 | 71.36 | 11.87 | 16.77 |
| 168.5 | 66.60 | 11.08 | 22.32 |
| A/B = 82.91/17.09 | | | |
| A + B | | | |
| 141.1E | 82.91 | 17.09 | 0 |
| B | | | |
| 145.9*** | 82.08 | 16.92 | 1.00 |
| 154.6††† | 81.28 | 16.74 | 1.98 |
| 165.0‡‡‡ | 80.48 | 16.59 | 2.93 |
| 173.7§§§ | 79.68 | 16.43 | 3.89 |

* This mixture gives E[B + Mix. ($NH_4NO_3$ + $KNO_3$)] at 134.7°C.
† At 137.0°C.
‡ At 139.4°C.
§ Mixtures 85.45–82.50 M % A give a ternary E[A + B + Mix. ($NH_4NO_3$ + $KNO_3$)] at 134.5°C.
‖ This mixture gives E(A + B) at 136.6°C.
¶ At 137.0°C.
** At 136.8°C.
†† At 135.4°C.
‡‡ This mixture gives E(A + B) at 138.8°C.
§§ At 137.2°C.
‖‖ At 138.2°C
¶¶ At 137.4°C.
*** This mixture gives E(A + B) at 141.0°C.
††† At 140.0°C.
‡‡‡ At 138.4°C.
§§§ At 137.4°C.

**A = $NH_4NO_3$; B = $NH_4Cl$; C = $KNO_3$ (200) (A.)**

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| A/B = 82.91/17.09 | | | |
| A + B | | | |
| 141.1E | 82.91 | 17.09 | 0 |
| B | | | |
| 138.0 | 79.94 | 16.47 | 3.59 |
| 139.0* | 78.51 | 16.19 | 5.30 |
| 142.7† | 75.86 | 15.62 | 8.52 |
| 146.6‡ | 73.32 | 15.12 | 11.56 |
| 151.8§ | 69.87 | 14.40 | 15.73 |
| 156.8‖ | 67.73 | 13.95 | 18.32 |
| 160.8¶ | 66.38 | 13.69 | 19.93 |
| A/C = 88.92/11.08 | | | |
| A + Mix. (A + C) | | | |
| 157.5$E_1$ | 88.92 | 0 | 11.08 |
| A | | | |
| 153.0 | 86.91 | 2.26 | 10.83 |
| 143.7 | 81.99 | 7.80 | 10.21 |
| 139.6 | 79.17 | 10.97 | 9.86 |
| A + Mix. (A + C) + B | | | |
| 134.5E | 76.54 | 13.92 | 9.54 |
| B | | | |
| 139.8** | 75.55 | 15.04 | 9.41 |
| 149.5** | 74.57 | 16.14 | 9.29 |
| 154.6** | 74.09 | 16.68 | 9.23 |
| A/C = 86.90/13.10 | | | |
| Mix. (A + C) | | | |
| 160.0 | 86.90 | 0 | 13.10 |
| 153.4 | 83.74 | 3.64 | 12.62 |
| 149.7 | 82.07 | 5.56 | 12.37 |
| 144.4 | 79.90 | 8.06 | 12.04 |
| 136.8** | 76.24 | 12.26 | 11.50 |
| B | | | |
| 135.9** | 75.59 | 13.01 | 11.40 |
| 143.6** | 74.14 | 14.68 | 11.18 |
| 156.6** | 72.93 | 16.07 | 11.00 |
| 161.9 | 72.29 | 16.81 | 10.90 |
| 166.2 | 71.68 | 17.52 | 10.80 |
| A/C = 84.34/15.66 | | | |
| Mix. (A + C) | | | |
| 167.9 | 84.34 | 0 | 15.66 |
| 164.8 | 83.05 | 1.53 | 15.42 |
| 157.0 | 80.90 | 4.08 | 15.02 |
| 147.9 | 77.14 | 8.54 | 14.32 |
| 143.8 | 75.70 | 10.25 | 14.05 |
| B | | | |
| 141.7** | 74.30 | 11.90 | 13.80 |
| 142.8** | 73.62 | 12.72 | 13.66 |
| 145.9** | 72.32 | 14.26 | 13.42 |

* This mixture gives E(A + B) at 136.8°C.
† At 134.5°C.
‡ This mixture gives $E_1$[B + Mix. (A + C)] at 134.0°C.
§ At 142.0°C.
‖ At 146.2°C.
¶ At 152.8°C.
** This mixture gives ternary E[A + Mix. (A + B) + C] at 134.5°C.

**A = $NH_4NO_3$; B = $(NH_4)_2SO_4$; C = $NaNO_3$ (197) (A.)**

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| A/C = 95.28/4.72 | | | |
| A | | | |
| 156.1 | 95.28 | 0 | 4.72 |
| Mix. (A + B) | | | |
| 158.5 | 94.76 | 0.55 | 4.69 |
| 164.6 | 93.29 | 2.09 | 4.62 |
| 168.1 | 92.22 | 3.22 | 4.56 |
| A/C = 90.54/9.46 | | | |
| A | | | |
| 145.0 | 90.54 | 0 | 9.46 |
| Mix. (A + B) | | | |
| 147.3 | 90.04 | 0.55 | 9.41 |
| 152.1 | 88.81 | 1.91 | 9.28 |
| 156.0 | 87.90 | 2.91 | 9.19 |
| 157.2 | 87.27 | 3.61 | 9.12 |
| A/C = 85.76/14.24 | | | |
| A | | | |
| 132.1 | 85.76 | 0 | 14.24 |
| Mix. (A + B) | | | |
| 134.8 | 85.18 | 0.67 | 14.15 |
| 139.0 | 84.06 | 1.98 | 13.96 |
| 140.0 | 83.47 | 2.67 | 13.86 |
| 140.4 | 83.25 | 2.92 | 13.83 |
| A/C = 83.36/16.64 | | | |
| A | | | |
| 125.8 | 83.36 | 0 | 16.64 |
| Mix. (A + B) | | | |
| 128.6 | 82.85 | 0.61 | 16.54 |
| 132.8 | 81.86 | 1.79 | 16.34 |
| 139.0 | 80.49 | 3.44 | 16.07 |
| 144.9 | 79.05 | 5.18 | 15.77 |
| A/C = 80.95/19.05 | | | |
| A | | | |
| 121.6 | 80.95 | 0 | 19.05 |
| 121.0 | 80.74 | 0.27 | 18.99 |
| Mix. (A + B) | | | |
| 122.9 | 80.51 | 0.55 | 18.94 |
| 123.7 | 80.30 | 0.80 | 18.90 |
| 126.1 | 79.25 | 2.11 | 18.64 |
| 129.2 | 78.27 | 3.31 | 18.42 |
| A/C = 76.12/23.88 | | | |
| C | | | |
| 134.0 | 76.12 | 0 | 23.88 |
| 131.6 | 75.65 | 0.62 | 23.73 |
| 127.8 | 74.61 | 1.99 | 23.40 |
| 122.5 | 73.64 | 3.26 | 23.10 |
| 119.9 | 73.34 | 3.65 | 23.01 |
| $Na_2SO_4$ | | | |
| 119.0 | 72.90 | 4.23 | 22.87 |
| 123.0 | 72.40 | 4.88 | 22.72 |
| 134.0 | 71.94 | 5.49 | 22.57 |
| A/C = 71.26/28.74 | | | |
| C | | | |
| 147.7 | 71.26 | 0 | 28.74 |
| 144.7 | 70.47 | 1.11 | 28.42 |
| 138.4 | 69.58 | 2.35 | 28.07 |
| 132.0 | 68.43 | 3.98 | 27.59 |
| $Na_2SO_4$ | | | |
| 126.0 | 67.52 | 5.25 | 27.23 |
| 132.1 | 67.12 | 5.81 | 27.07 |

A = $NH_4NO_3$; B = $(NH_4)_2SO_4$; C = $KNO_3$ (199) (A.)

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| A/C = 96.81/3.19 | | | |
| A | | | |
| 166.1 | 96.81 | 0 | 3.19 |
| Mix. (A + B) | | | |
| 168.4 | 96.43 | 0.39 | 3.18 |
| 170.1 | 95.84 | 1.00 | 3.16 |
| 173.9 | 94.87 | 2.01 | 3.12 |
| 176.1 | 93.80 | 3.11 | 3.09 |
| 177.0 | 93.02 | 3.92 | 3.06 |
| 178.2 | 92.36 | 4.60 | 3.04 |
| A/C = 93.57/6.43 | | | |
| A | | | |
| 162.6 | 93.57 | 0 | 6.43 |
| Mix. (A + B) | | | |
| 164.6 | 93.22 | 0.37 | 6.41 |
| 167.2 | 92.67 | 0.96 | 6.37 |
| 171.0 | 91.62 | 2.08 | 6.30 |
| 173.7 | 90.52 | 3.25 | 6.23 |
| 175.0 | 89.18 | 4.69 | 6.13 |
| A/C = 91.09/8.91 | | | |
| A | | | |
| 159.8 | 91.09 | 0 | 8.91 |
| Mix. (A + B) | | | |
| 163.4 | 90.55 | 0.60 | 8.85 |
| 168.6 | 89.27 | 2.01 | 8.72 |
| 171.1 | 88.33 | 3.03 | 8.64 |
| 172.6 | 87.60 | 4.32 | 8.52 |
| A/C = 88.93/11.07 | | | |
| A + Mix. (A + C) | | | |
| 157.2 | 88.93 | 0 | 11.07 |
| Mix. $[(NH_4)_2SO_4 + K_2SO_4]$ | | | |
| 159.3 | 88.70 | 0.25 | 11.05 |
| 162.2 | 88.30 | 0.72 | 10.98 |
| 164.9 | 87.70 | 1.38 | 10.92 |
| 166.6 | 87.06 | 2.10 | 10.84 |
| 169.9 | 85.75 | 4.23 | 10.68 |
| A/C = 86.05/13.95 | | | |
| Mix. (A + C) | | | |
| 162.8 | 86.05 | 0 | 13.95 |
| 162.1 | 85.69 | 0.42 | 13.89 |
| Mix. (A + C) + Mix. $[(NH_4)_2SO_4 + K_2SO_4]$ | | | |
| 160.4E | 85.28 | 0.90 | 13.82 |
| Mix. $[(NH_4)_2SO_4 + K_2SO_4]$ | | | |
| 161.1 | 85.07 | 1.14 | 13.79 |
| 162.8 | 84.61 | 1.68 | 13.71 |
| 165.6 | 83.80 | 2.62 | 13.58 |
| 168.0 | 82.97 | 3.58 | 13.45 |
| 169.3 | 82.11 | 4.58 | 13.31 |
| A/C = 84.34/15.66 | | | |
| Mix. (A + C) | | | |
| 167.4 | 84.34 | 0 | 15.66 |
| 166.1 | 84.06 | 0.34 | 15.60 |
| 165.2 | 83.75 | 0.71 | 15.54 |
| 162.9 | 82.90 | 1.72 | 15.38 |
| Mix. $[(NH_4)_2SO_4 + K_2SO_4]$ | | | |
| 162.7 | 82.68 | 1.98 | 15.34 |
| 163.0 | 82.56 | 2.12 | 15.32 |
| 164.3 | 82.14 | 2.62 | 15.24 |
| 166.2 | 81.55 | 3.32 | 15.13 |
| 167.5 | 81.14 | 3.80 | 15.06 |
| A/C = 83.05/16.95 | | | |
| Mix. (A + C) | | | |
| 171.4 | 83.05 | 0 | 16.95 |
| 170.1 | 82.70 | 0.42 | 16.88 |
| 167.8 | 82.14 | 1.10 | 16.76 |
| 164.5 | 81.33 | 2.08 | 16.59 |
| 163.7 | 80.85 | 2.65 | 16.50 |
| Mix. $[(NH_4)_2SO_4 + K_2SO_4]$ | | | |
| 163.7 | 80.72 | 2.81 | 16.47 |
| 164.4 | 80.32 | 3.29 | 16.39 |
| 166.7 | 79.67 | 4.08 | 16.25 |
| A/C = 81.75/18.25 | | | |
| Mix. (A + C) | | | |
| 174.5 | 81.75 | 0 | 18.25 |
| 172.1 | 81.16 | 0.73 | 18.11 |
| 168.0 | 80.23 | 1.86 | 17.91 |
| 165.7 | 79.43 | 2.84 | 17.73 |
| 165.0 | 79.11 | 3.24 | 17.65 |
| Mix. (A + C) + Mix. $[(NH_4)_2SO_4 + K_2SO_4]$ | | | |
| 164.9E | 78.75 | 3.68 | 17.57 |
| Mix. $[(NH_4)_2SO_4 + K_2SO_4]$ | | | |
| 165.7 | 78.42 | 4.08 | 17.50 |

A = $NH_4NO_3$; B = NaCl; C = $NaNO_3$ (196) (A.)

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| A/C = 95.00/5.00 | | | |
| A | | | |
| 156.0 | 95.00 | 0 | 5.00 |
| 145.3 | 92.42 | 2.72 | 4.86 |
| 134.6 | 89.86 | 5.40 | 4.74 |
| 123.3 | 87.34 | 8.06 | 4.60 |
| $NH_4NO_3$ + NH4Cl | | | |
| 120.0E | (?) | (?) | (?) |
| NH4Cl | | | |
| 124.0 | 84.89 | 10.65 | 4.46 |
| 132.5 | 82.42 | 13.24 | 4.34 |
| 140.4 | 80.01 | 15.78 | 4.21 |
| B | | | |
| 146.4 | 79.40 | 16.41 | 4.19 |
| 154.5 | 78.83 | 17.03 | 4.14 |
| 160.0 | 78.24 | 17.64 | 4.12 |
| 171.3 | 77.64 | 18.27 | 4.09 |
| A/C = 91.00/9.00 | | | |
| A | | | |
| 146.0 | 91.00 | 0 | 9.00 |
| 135.5 | 88.52 | 2.74 | 8.74 |
| 124.5 | 86.08 | 5.42 | 8.50 |
| $NH_4NO_3$ + NH4Cl | | | |
| 114.7E | 83.66 | 8.09 | 8.25 |
| NH4Cl | | | |
| 124.0 | 81.27 | 10.70 | 8.03 |
| 133.5 | 78.93 | 13.27 | 7.80 |
| 136.5 | 78.35 | 13.91 | 7.74 |
| B | | | |
| 142.2 | 77.75 | 14.55 | 7.70 |
| 157.7 | 76.62 | 15.81 | 7.57 |
| A/C = 87.38/12.62 | | | |
| A | | | |
| 136.5 | 87.38 | 0 | 12.62 |
| 130.0 | 86.02 | 1.55 | 12.43 |
| 123.0 | 84.43 | 3.37 | 12.20 |
| 113.5 | 81.83 | 6.36 | 11.81 |
| $NH_4NO_3$ + $NaNO_3$ + NH4Cl | | | |
| 113.0E | 81.46 | 6.77 | 11.77 |
| A/C = 87.38/12.62 | | | |
| C | | | |
| 115.0 | 80.98 | 7.32 | 11.70 |
| 128.0 | 77.76 | 11.00 | 12.24 |
| 134.5 | 76.06 | 12.96 | 10.98 |
| B | | | |
| 144.0 | 75.54 | 13.55 | 10.91 |
| 147.0 | 75.26 | 13.87 | 10.87 |
| 164.5 | 74.34 | 14.92 | 10.74 |
| A/C = 83.83/16.17 | | | |
| A | | | |
| 127.0 | 83.83 | 0 | 16.17 |
| 119.3 | 81.54 | 2.74 | 15.72 |
| A + C | | | |
| 116.0E | (?) | (?) | (?) |
| C | | | |
| 118.2 | 79.19 | 5.54 | 15.27 |
| 127.4 | 77.03 | 8.11 | 14.86 |
| 133.8 | 74.84 | 10.73 | 14.43 |
| B | | | |
| 158.1 | 72.67 | 13.32 | 14.01 |
| 167.3 | 72.13 | 13.96 | 13.91 |
| A/C = 80.85/19.15 | | | |
| A + C | | | |
| 121.0E | 80.85 | 0 | 19.15 |
| A | | | |
| 120.7 | 80.30 | 0.69 | 19.01 |
| A + C | | | |
| 119.5E | 79.50 | 1.68 | 18.82 |
| C | | | |
| 121.5* | 78.67 | 2.69 | 18.64 |
| 126.0† | 77.64 | 3.98 | 18.38 |
| 133.2‡ | 75.61 | 6.48 | 17.91 |
| 140.4‡ | 73.72 | 8.83 | 17.45 |
| 153.0‡ | 71.11 | 12.05 | 16.84 |
| 164.4‡ | 70.59 | 12.69 | 16.72 |
| 176.2‡ | 69.64 | 13.86 | 16.50 |
| A/C = 76.02/23.98 | | | |
| C | | | |
| 132.0 | 76.02 | 0 | 23.98 |
| 138.4 | 73.92 | 2.75 | 23.33 |
| 144.9 | 71.85 | 5.47 | 22.68 |
| 151.2 | 69.82 | 8.14 | 22.04 |
| 160.2 | 68.04 | 10.49 | 21.47 |

* This mixture gives E(A + C) at 118.0°C.
† At 115.5°C.
‡ E(A + B + C) at 112.2°C.

A = $NH_4NO_3$; B = $Na_2SO_4$; C = $NaNO_3$ (196) (A.)

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| A/C = 85.76/14.24 | | | |
| A | | | |
| 132.0 | 85.76 | 0 | 14.24 |
| Mix. $(NH_4NO_3 + (NH_4)_2SO_4)$ | | | |
| 131.0 | 85.27 | 0.57 | 14.16 |
| 128.5 | 84.28 | 1.72 | 14.00 |
| 123.8 | 82.86 | 3.38 | 13.76 |
| 121.5 | 82.14 | 4.22 | 13.64 |
| A/C = 84.90/15.10 | | | |
| A | | | |
| 125.8 | 84.90 | 0 | 15.10 |
| Mix. $(NH_4NO_3 + (NH_4)_2SO_4)$ | | | |
| 124.2 | 84.26 | 0.75 | 14.99 |
| 121.3 | 83.30 | 1.88 | 14.82 |
| A/C = 84.90/15.10 | | | |
| Mix. $(NH_4NO_3 + (NH_4)_2SO_4)$ | | | |
| 120.2 | 83.00 | 2.23 | 14.77 |
| 119.2 | 82.28 | 3.08 | 14.64 |
| 120.0 | 81.97 | 3.44 | 14.59 |
| 123.0 | 81.39 | 4.24 | 14.46 |
| A/C = 80.95/19.05 | | | |
| A | | | |
| 121.5 | 80.95 | 0 | 19.05 |
| 120.1 | 80.72 | 0.29 | 18.99 |
| 118.6 | 80.49 | 0.57 | 18.94 |
| 117.5 | 80.02 | 1.15 | 18.83 |
| C | | | |
| 119.0 | 79.55 | 1.73 | 18.72 |
| 123.9 | 78.89 | 2.55 | 18.56 |
| 127.1 | 78.31 | 3.27 | 18.42 |
| 131.3 | 77.34 | 4.47 | 18.19 |
| A/C = 80.42/19.58 | | | |
| C | | | |
| 125.0 | 80.42 | 0 | 19.58 |
| 126.0 | 80.10 | 0.40 | 19.50 |
| 128.0 | 79.62 | 0.99 | 19.39 |
| 129.9 | 78.96 | 1.81 | 19.23 |
| 133.0 | 78.04 | 2.95 | 19.01 |

A = $NH_4NO_3$; B = KCl; C = $KNO_3$ (200) (A.)

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| A/C = 96.81/3.19 | | | |
| A | | | |
| 166.0 | 96.81 | 0 | 3.19 |
| 159.4 | 94.76 | 2.12 | 3.12 |
| 152.7 | 92.16 | 4.80 | 3.04 |
| Mix. (A + C) | | | |
| 143.9 | 89.11 | 7.96 | 2.93 |
| 142.9* | 86.10 | 11.06 | 2.84 |
| 142.9 | 84.56 | 12.65 | 2.79 |
| NH4Cl | | | |
| 143.0† | 84.10 | 13.13 | 2.77 |
| 149.7‡ | 83.54 | 13.71 | 2.75 |
| 154.4§ | 83.02 | 14.25 | 2.73 |
| 160.8‖ | 82.50 | 14.78 | 2.72 |
| A/C = 93.56/6.44 | | | |
| A | | | |
| 162.8 | 93.56 | 0 | 6.44 |
| 158.3 | 92.09 | 1.58 | 6.33 |
| 149.1 | 88.91 | 4.98 | 6.11 |
| 148.6¶ | 87.70 | 6.27 | 6.03 |
| 148.1** | 86.50 | 7.55 | 5.95 |
| Mix. (A + C) | | | |
| 147.7 | 85.35 | 8.78 | 5.87 |
| 147.6†† | 84.65 | 9.53 | 5.82 |
| 148.0 | 82.43 | 11.90 | 5.67 |
| NH4Cl | | | |
| 149.4‡‡ | 81.54 | 12.85 | 5.61 |
| 151.6§§ | 81.15 | 13.26 | 5.59 |
| 158.7‖‖ | 80.36 | 14.11 | 5.53 |
| 166.0 | 79.54 | 14.99 | 5.47 |
| A/C = 88.92/11.08 | | | |
| A + Mix. (A + C) | | | |
| 157.5E | 88.92 | 0 | 11.08 |

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| A/C = 88.92/11.08 | | | |
| Mix. (A + C) | | | |
| 156.3 | 86.54 | 2.68 | 10.78 |
| 155.6 | 84.28 | 5.22 | 10.50 |
| 157.0 | 84.00 | 5.55 | 10.45 |
| 158.0 | 82.10 | 7.67 | 10.23 |
| 162.9 | 80.17 | 9.85 | 9.98 |

* This mixture gives ternary E [Mix. (A + C) + A + $NH_4Cl$] at 134.5°C.
† This mixture gives $E_1$ [Mix. (A + C) + $NH_4Cl$] at 142.9°C.
‡ At 143.9°C.
§ At 144.7°C.
‖ At 146.1°C.
¶ This mixture gives $E_1$[A + Mix. (A + C)] at 145.4°C.
** At 140.3°C.
†† This mixture gives ternary E[A + $NH_4Cl$ + Mix. (A + C)] at 134.5°C.
‡‡ This mixture gives $E_2$[$NH_4Cl$ + Mix. (A + C)] at 147.4°C.
§§ At 148.0°C.
‖‖ At 150.5°C.

**A = $NH_4NO_3$; B = $K_2SO_4$; C = $KNO_3$ (199) (A.)**

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| A/C = 88.93/11.07 | | | |
| A + Mix. (A + C) | | | |
| 157.2E | 88.93 | 0 | 11.07 |
| Mix. ($K_2SO_4$ + $(NH_4)_2SO_4$) | | | |
| 158.3 | 88.76 | 0.19 | 11.05 |
| 160.8 | 88.08 | 0.95 | 10.97 |
| 163.2 | 87.44 | 1.67 | 10.89 |
| 164.0 | 87.16 | 1.98 | 10.86 |
| 164.5 | 86.71 | 2.50 | 10.79 |

**A = $NH_4Cl$; B = NaCl; C = $NaNO_3$ (196) (A.)**

| $t_L$, °C | M % A | M % B | M % C |
|---|---|---|---|
| C/A = 82.04/17.96 | | | |
| $NH_4NO_3$ + $NH_4Cl$ | | | |
| 141.0E | 17.96 | 0 | 82.04 |
| A | | | |
| 141.0* | 17.93 | 0.17 | 81.90 |
| 145.5† | 17.74 | 1.19 | 81.07 |
| 155.0‡ | 17.43 | 3.00 | 79.57 |
| 164.5 | 17.14 | 4.58 | 78.28 |
| C/A = 85.70/14.30 | | | |
| $NH_4NO_3$ | | | |
| 148.0 | 14.30 | 0 | 85.70 |
| 143.5 | 14.14 | 1.15 | 84.71 |
| 140.5 | 14.02 | 1.95 | 84.03 |
| $NH_4NO_3$ + $NH_4Cl$ | | | |
| 137.0E | (?) | (?) | (?) |
| A | | | |
| 140.0§ | 13.71 | 4.20 | 82.09 |
| 142.5‖ | 13.60 | 4.86 | 81.54 |
| 153.0 | 13.28 | 7.16 | 79.56 |
| 166.5 | 12.95 | 9.45 | 77.60 |

* This mixture gives E($NH_4NO_3$ + $NH_4Cl$) at 140.5°C.
† At 138.5°C.
‡ At 134.5°C.
§ This mixture gives E($NH_4NO_3$ + $NH_4Cl$) at 133.0°C.
‖ At 132.5°C.

**A = $PbCl_2$; B = $PbBr_2$; C = $PbI_2$ (155); Fig. 46**

**A = $PbCl_2$; B = NaCl; C = KCl (255); Fig. 47**

**A = $Pb(NO_3)_2$; B = $NaNO_3$; C = $KNO_3$ (99) (A.)**

| $t$, °C | M % A | M % B |
|---|---|---|
| A + B + C | | |
| 186E | 18.04 | 30.18 |

**A = $CdCl_2$; B = NaCl; C = KCl (42); Fig. 48**

**A = $CdBr_2$; B = NaBr; C = KBr (44); Fig. 49**

**A = AgCl; B = AgBr; C = AgI (155); Fig. 50**

**A = $AlF_3$; B = $CaF_2$; C = NaF (75); Fig. 51**

**A = MgO; B = NaF; C = KF (28) (A.)**

| $t_L$, °C | M % A | M % B |
|---|---|---|
| B/C = 39.98/60.02 | | |
| (?) | | |
| 702* | 0 | 39.98 |
| 709 | 1.26 | 39.47 |
| 701 | 3.73 | 37.56 |
| 695.5 | 6.04 | 36.68 |
| 677 | 11.40 | 35.42 |
| 951 | 16.14 | 33.52 |

* E for B + C.

**A = $MgF_2$; B = $CaF_2$; C = $BaF_2$ (28) (A.)**

| $t_L$, °C | M % A | M % B |
|---|---|---|
| A/B = 55.63/44.37 | | |
| (?) | | |
| 954* | 55.63 | 44.37 |
| 926 | 53.29 | 42.50 |
| 935 | 50.62 | 40.38 |
| 935 | 47.56 | 37.94 |
| 905 | 44.02 | 35.16 |
| 886 | 39.86 | 31.80 |
| 835 | 34.91 | 27.84 |
| 790 | 28.93 | 23.07 |
| 935 | 21.54 | 17.19 |
| 1120 | 12.20 | 9.73 |
| (1288) | 0 | 0 |

All these mixtures give a halting pt. at 790–810°.

* E for A + B.

**A = $MgCl_2$; B = $BaCl_2$; C = KCl (154) (A.)**

| $t_L$, °C | M % A | M % B |
|---|---|---|
| B/C = 33.33/66.67 | | |
| $BC_2$ | | |
| 660 | 0 | 33.33 |
| 645 | 11 | 26 |
| $BC_2$ + AC* | | |
| 445E | 45 | 3 |
| AC | | |
| 465 | 48 | 1 |
| 486 | 50 | 0 |
| A/C = 50/50 | | |
| AC | | |
| 486 | 50 | 0 |
| 460 | 48 | 2.5 |
| AC + $BC_2$ | | |
| 440$E_1$ | 46 | 7 |
| $BC_2$ | | |
| 445 | 43.5 | 12 |

* $BC_2$ + AC = pseudobinary system. All mixtures give the E at 445°.

| $t_L$, °C | M % A | M % B |
|---|---|---|
| A/C = 50/50 | | |
| $BC_2$ + B | | |
| 440$E_2$ | | |
| B | | |
| 460 | 40.5 | 17.5 |
| 650 | 34 | 28 |
| 720 | 32 | 35 |
| 810 | 26.5 | 46.5 |
| 870 | 15 | 69.5 |
| 922 | 0 | 100 |

AC + B = pseudobinary system
0–12% $BaCl_2$ give $E_1$ at 440°
12–100% $BaCl_2$ give $E_2$ at 440°
All mixtures give a ternary E (AC + $BC_2$ + B) at 435°

| | | |
|---|---|---|
| C/B = 66.7/33.3 | | |
| $BC_2$ | | |
| 660 | 0 | 33.3 |
| 650 | 11.5 | 29.5 |
| 630 | 22.5 | 26 |
| 540 | 28.5 | 24 |
| | 34 | 22 |
| $BC_2$ + B | | |
| 445$E_1$ | | |
| B | | |
| 470 | 39 | 20.5 |
| 470 | 45 | 18.5 |
| 475 | 51.5 | 16.5 |
| B + A | | |
| 450$E_2$ | 56.5 | 14.5 |
| A | | |
| 490 | 63 | 12.5 |
| 540 | 68 | 11 |
| 620 | 79 | 7 |
| 770 | 100 | 0 |

$BC_2$ + A = pseudobinary system. Mixtures of 0–51.5% A give $E_1$ at 445° and a ternary E(AC + $BC_2$ + B) at 432°. Mixtures of 51.5–100% A give $E_2$ at 450° and a ternary E (AC + B + A) at 440°.

**A = $MgCl_2$; B = NaCl; C = KCl (243); Fig. 52**

**A = CaO; B = $CaF_2$; C = $CaCl_2$ (18) (A.)**

| $t_L$, °C | M % A | M % B |
|---|---|---|
| A | | |
| *ca.* 800 | 13.26 | 12.30 |

**A = CaO; B = BaO; C = $BaCl_2$ (222) (A.)**

| | | |
|---|---|---|
| A | | |
| 921 | 3.22 | 0 |
| 931 | 2.22 | 0.22 |
| 940 | 0.91 | 2.02 |
| 938 | 0.57 | 6.03 |

**A = $CaCl_2$; B = $SrCl_2$; C = $BaCl_2$ (239); Fig. 54**

**A = $CaCl_2$; B = NaCl; C = KCl (145, 243); Fig. 55**

**A = $Ca(NO_3)_2$; B = $NaNO_3$; C = $KNO_3$ (160); Fig. 53**

**A = $CaCO_3$; B = $Na_2CO_3$; C = $K_2CO_3$ (173); Fig. 56**

**A = $SrCl_2$; B = $BaCl_2$; C = NaCl (263); Fig. 57**

**A = $SrCl_2$; B = $BaCl_2$; C = KCl (263); Fig. 58**

**A = $SrCl_2$; B = NaCl; C = KCl (243); Fig. 59**

**A = $Sr(NO_3)_2$; B = $NaNO_3$; C = $KNO_3$ (107) (A.)**

| $t_L$, °C | M % A | M % B |
|---|---|---|
| (?) | | |
| 254.2 | 8.12 | 43.25 |
| 221.8 | 5.25 | 52.64 |
| 210.0 | 5.26 | 43.13 |
| 209.5 | 5.26 | 42.11 |
| 210.5 | 5.26 | 41.04 |
| 226.8 | 5.26 | 31.58 |
| 209.0 | 4.71 | 43.97 |
| 208.4 | 4.71 | 42.94 |
| 209.2 | 4.71 | 41.89 |
| 210.0 | 4.16 | 43.76 |
| 211.2 | 4.16 | 42.71 |
| 213.8 | 2.57 | 46.15 |

**A = $BaCl_2$; B = NaCl; C = KCl (87, 263); Fig. 60**

**A = $Ba(NO_3)_2$; B = $LiNO_3$; C = $KNO_3$ (91) (A.)**

| $t_L$, °C | M % A | M % B |
|---|---|---|
| (?) | | |
| 299.1 | 5.26 | 84.22 |
| 310.4 | 5.26 | 73.70 |
| 317.4 | 5.26 | 63.17 |
| 303.7 | 5.26 | 52.65 |

**A = $Ba(NO_3)_2$; B = $NaNO_3$; C = $KNO_3$ (107); Fig. 61**

**A = LiCl; B = NaCl; C = KCl (215, 239); Fig. 62**

**A = LiCl; B = NaCl; C = RbCl (215) (A.)**

| $t_L$, °C | M % A | M % B |
|---|---|---|
| (?) | | |
| 320* | 58.3 | 0 |
| 318 | 56.6 | 2.4 |
| 328 | 54.1 | 6.7 |
| 460 | 45.5 | 21.3 |
| 545 | 37.6 | 34.9 |

* E for A + C.

**A = LiCl; B = NaCl; C = CsCl (215) (A.)**

| $t_L$, °C | M % A | M % B |
|---|---|---|
| (?) | | |
| 325* | 59.0 | 0 |
| 323 | 58.3 | 1.1 |
| 320 | 58.0 | 1.7 |
| 326 | 55.0 | 6.8 |
| 354 | 53.6 | 9.0 |
| 431 | 49.4 | 16.3 |
| 493 | 44.7 | 24.1 |

* E for A + C.

**A = $LiNO_3$; B = $NaNO_3$; C = $KNO_3$ (60), Fig. 63**

A = NaOH; B = $Na_2CO_3$; C = KOH (171) (A.)

| $t_L$, °C | M % A | M % B |
|---|---|---|
| | A/C = 50/50 (?) | |
| 167 | 50.00 | 0 |
| 183 | 48.93 | 2.14 |
| 199 | 47.35 | 5.30 |
| 214 | 45.53 | 8.94 |
| 219.5 | 44.63 | 10.74 |

A = NaOH; B = $Na_2CO_3$; C = $K_2CO_3$ (171) (A.)

| | | |
|---|---|---|
| | B/C = 55.25/44.75 (?) | |
| **290.0** | 100 | 0 |
| 275.5 | 96.90 | 1.91 |
| 265.0 | 91.90 | 5.00 |
| 266.0 | 89.64 | 6.39 |
| 267.5 | 87.63 | 7.62 |

A = NaF; B = NaCl; C = $Na_2SO_4$ (273); Fig. 64

$A_1 = SnO_2$; $A_2 = PbO$; $A_3 = ZnS$; $A_4 = CuO$; $A_5 = ZnO$

B = Sea salt (98.14 Wt. % NaCl; 0.23% $MgCl_2$; 0.24% $MgSO_4$; 0.19% $K_2SO_4$; 0.71% $CaSO_4$; 0.24% $H_2O$; 0.24% insol.) (114) (A.)

| $t$, °C | Wt. % $A_1$* |
|---|---|
| 890 | 0.006 |
| 880 | 0.014 |
| 1150 | 0.016 |
| $t$, °C | Wt. % $A_2$* |
| 900 | 0.153 |
| 870 | 0.194 |
| 920 | 0.272 |
| 1220 | 0.431 |
| $t$, °C | Wt. % $A_3$* |
| 870 | 0.099 |
| 865 | 0.121 |
| 900 | 0.135 |
| 900 | 0.152 |
| 920 | 0.318 |
| 1220 | 0.540 |
| 1190 | 0.702 |
| $t$, °C | Wt. % $A_4$* |
| 900 | 0.281 |
| 910 | 0.361 |
| 920 | 0.790 |
| $t$, °C | Wt. % $A_5$* |
| 890 | 0.32 |
| 870 | 0.221 |
| 1250 | 0.52 |

* Dissolved in B.

## LITERATURE

(For a key to the periodicals see end of volume)


(1) Amadori, *22*, **21 I**: 467; 12. (2) Amadori, *22*, **21 II**: 67; 12. (3) Amadori, *22*, **21 II**: 183; 12. (4) Amadori, *22*, **21 II**: 688; 12. (5) Amadori, *22*, **21 II**: 768; 12. (6) Amadori, *22*, **22 I**: 453, 609; 13. (7) Amadori, *22*, **22 II**: 332; 13. (8) Amadori, *22*, **22 II**: 366; 13. (9) Amadori, *24*, **72 I**: 451; 13. (10) Amadori, *24*, **72 II**: 893; 13. (11) Amadori, *24*, **72 II**: 903; 13. (12) Amadori, *24*, **73 II**: 1665; 14. (13) Amadori, *24*, **73 II**: 1679; 14. (14) Amadori, *22*, **24 II**: 200; 15. (15) Amadori, *24*, **76 II**: 419; 17. (16) Amadori, *36*, **49 I**: 38; 19. (17) Amadori and Pampanini, *22*, **20 II**: 572; 11. (18) Arctowski, *93*, **6**: 260; 94. **11**: 272; 96. (19) Arndt, *25*, **40**: 427; 07. (20) Arndt and Löwenstein, *9*, **15**: 784; 09. (21) Aten, *7*, **68**: 41; 19. (22) Bagster, *4*, **99**: 1218; 11. (23) Bakhuis Roozeboom, *7*, **2**: 449; 88. (24) Barth, *Diss.*, Aachen, 1912. (25) Baume and Georgitses, *42*, **12**: 250; 14. *34*, **154**: 650; 12. (26) Baume and Pamfil, *42*, **12**: 256; 14. (27) Baume and Robert, *34*, **169**: 968; 19. (28) Beck, *192*, **5**: 504; 08. (29) Beckmann, *93*, **51**: 96; 06. (30) Beckmann, *93*, **55**: 175; 07. (31) Beckmann, *93*, **89**: 167; 14. (32) Belladen, *36*, **52 I**: 161; 22. (33) Bergmann and Genke, *63*, **58**: 83; 26. (34) Bernhardis, *22*, **21 I**: 438; 12. (35) Boeke, *93*, **50**: 355; 07. (36) Bogitch, *34*, **161**: 790; 15. (37) Boks, *Diss.*, Amsterdam, 1902. (38) Bond and Beach, *1*, **48**: 348; 26. (39) Botta, *189*, **1911**: 23. (40) Bousfield, *4*, **115**: 45; 19. (41) Bradley and Alexander, *1*, **34**: 15; 12. (42) Brand, *190B*, **32**: 627; 11. (43) Brand, *189*, **1912**: 26. (44) Brand, *190*, **1913 I**: 9. (45) Briscoe and Madgin, *4*, **123**: 1608; 23. (46) Bruni and Meneghini, *93*, **64**: 193; 09. (47) Büchner, *7*, **54**: 665; 06. (48) Calcagni, *36*, **42 II**: 652; 12. 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(118) Isbekow, *93*, **143**: 80; 25. (119) Jaeger, *64V*, **20**: 497; 11. (120) Jaeger and Doornbosch, *93*, **75**: 261; 12. (121) Jaeger and Germs, *93*, **91**: 194; 15. (122) Jaeger and Germs, *93*, **119**: 145; 21. (123) Jaeger and van Klooster, *93*, **78**: 245; 12. (124) Jaenecke, *7*, **64**: 343; 08. (125) Jaenecke, *7*, **80**: 1; 12. (126) Kablukov, *7*, **65**: 121; 09. (127) Karandyeev, *189*, **1909**: 728. (128) Karandyeev, *93*, **68**: 188; 10. (129) Kellner, *93*, **99**: 137; 17. (130) Kendall, Crittenden and Miller, *1*, **45**: 963; 23. (131) Kendall and Davidson, *1*, **42**: 1141; 20. (132) Kendall and Davidson, *1*, **43**: 979; 21. (133) Kendall and Landon, *1*, **42**: 2131; 20. (134) van Klooster, *93*, **69**: 122; 11. (135) Kohlmeyer, *136*, **36**: 1079; 12. (136) Konno, *429*, **4**: 51; 19. (137) Korreng, *190B*, **37**: 50; 14. (138) Korreng, *93*, **91**: 194; 15. (139) Kraus and Cuy, *1*, **45**: 712; 23. (140) Kroll, *93*, **77**: 1; 12. 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(162) Mönkmeyer, *190B*, **22**: 1; 06. (163) Moles, *7*, **90**: 70; 15. (164) Müller, *190B*, **30**: 1; 10. (165) Nacken, *188*, **1907**: 602. (166) Nacken, *190B*, **24**: 1; 07. (167) Nacken, *189*, **1907**: 301. (168) Nacken, *189*, **1912**: 545. (168b) Nacken, *76*, **1918**: 192. (170) Nest, *94*, **47**: 263; 10. (171) Neumann and Bergve, *9*, **20**: 271; 14. (172) Niggli, *93*, **98**: 241; 16. (173) Niggli, *93*, **106**: 126; 19. (174) Oddo, *36*, **31 II**: 158; 01. (175) Oddo, *36*, **31 II**: 138; 02. (176) Oddo and Mannessier, *36*, **41 II**: 212; 11. (177) Oddo and Scandola, *36*, **38 I**: 603; 08. *7*, **62**: 243; 08. (178) Oddo and Scandola, *36*, **39 I**: 569; 09. *7*, **66**: 138; 09. (179) Oddo and Scandola, *36*, **39 II**: 1, 44; 09. (180) Oddo and Scandola, *36*, **40 II**: 163; 10. (181) Oddo and Tealdi, *36*, **33 II**: 427; 03. (182) Osaka, *479*, **1**: 341; 16. (183) Oswald, *6*, **1**: 32; 14. (184) Padoa and Tibaldi, *36*, **34**: 92; 04. (185) Panebianco, *508*, **44**: 3; 15. (186) Parravano, *36*, **39 II**: 55; 09. (187) Parravano and Calcagni, *93*, **65**: 1; 10. (188) Parravano and de Cesaris, *36*, **42 II**: 1; 12. (189) Pascal, *27*, **11**: 321; 12. (190) Pascal, *27*, **33**: 539; 23. (191) Pascal and Ero, *27*, **25**: 35; 19. (192) Pascal and Garnier, *27*, **25**: 309; 19. (193) Pascal and Jouniaux, *27*, **13**: 439; 13. (194) Pelabon, *34*, **140**: 1389; 05. (195) Pelabon, *34*, **146**: 975; 08. (196) Perman, *4*, **121**: 2473; 22. (197) Perman and Harrison, *4*, **125**: 364; 24. (198) Perman and Harrison, *4*, **125**: 1709; 24. (199) Perman and Howells, *4*, **123**: 2128; 23. (200) Perman and Saunders, *4*, **123**: 841; 23. (201) Plato, *7*, **58**: 350; 07. (202) Poma and Gabbi, *22*, **20 I**: 464; 11. (203) Ponomarev, *93*, **89**: 382; 14. (204) Ponomarev, *Soobscenija naučnotechn-rabiach Respublike, Moskva*, **1921**: 67. *10*, **5**: 132; 25. (205) Pushin and Baskow, *93*, **81**: 347; 13. (206) Pushin and Löwy, *93*, **150**: 167; 26. (207) Quartaroli, *36*, **50 II**: 64; 20. (208) Quercigh, *22*, **21 I**: 415; 12. (209) Quercigh, *22*, **23 I**: 825; 14. (210) Rack, *189*, **1913**: 373. (211) Räder, *93*, **130**: 325; 23. (212) Ramsay, *7*, **5**: 221; 90. (213) Rassow, *93*, **114**: 117; 20. (214) Reinders, *7*, **32**: 494; 00. (215) Richards and Meldrum, *1*, **39**: 1816; 17. (216) Rosenheim, Stadker and Jacobsohn, *25*, **39**: 2837; 06. (217) Ruer, *93*, **49**: 365; 06. (218) Ruff, *25*, **42**: 4021; 09. (219) Ruff and Plato, *25*, **36**: 2357; 03. (220) Sackur, *9*, **16**: 649; 10. (221) Sackur, *7*, **78**: 550; 12. (222) Sackur, *7*, **78**: 564; 12. (223) Sackur, *7*, **83**: 297; 13. (224) Sandonnini, *36*, **41 II**: 144; 11. (225) Sandonnini, *24*, **71 I**: 553; 12. (226) Sandonnini, *22*, **21 I**: 196; 12. (227) Sandonnini, *22*, **21 I**: 479; 12. (228) Sandonnini, *22*, **23 I**: 959; 14. (229) Sandonnini, *36*, **44 I**: 290; 14.

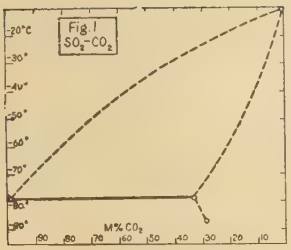


Fig. 1
$SO_3$-$CO_2$
M% $CO_2$

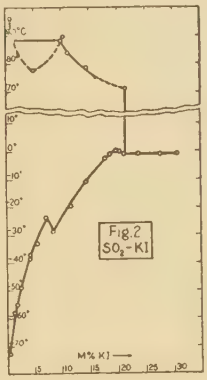
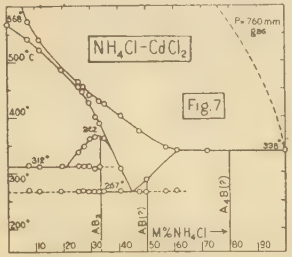
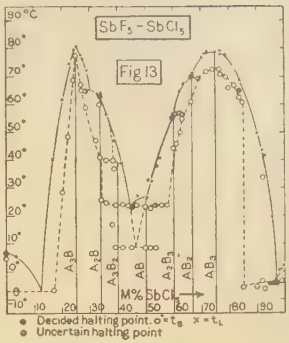


Fig. 2
$SO_2$-KI
M% KI


$NH_4Cl$-$CdCl_2$
Fig. 7
P=760 mm
M% $NH_4Cl$


$SbF_3$-$SbCl_3$
Fig. 13
M% $SbCl_3$
Decided halting point. o = $t_s$ x = $t_L$
Uncertain halting point

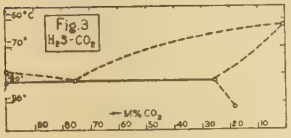
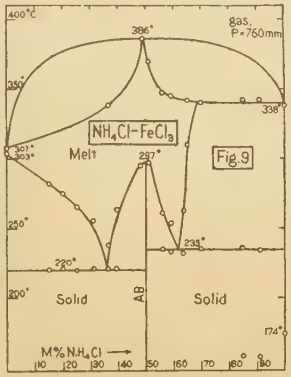
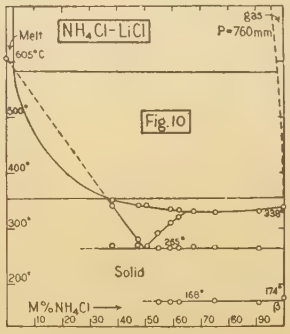


Fig. 3
$H_2S$-$CO_2$
M% $CO_2$


$NH_4Cl$-$FeCl_3$
Fig. 9
Melt
Solid
Solid
M% $NH_4Cl$


$NH_4Cl$-LiCl
Fig. 10
Melt
P=760 mm
Solid
M% $NH_4Cl$

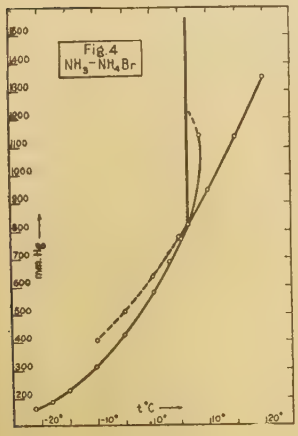
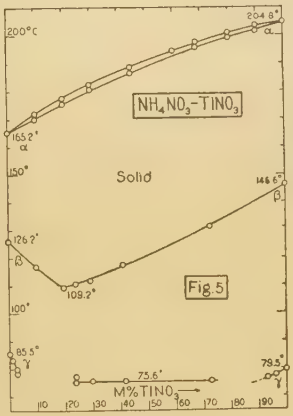
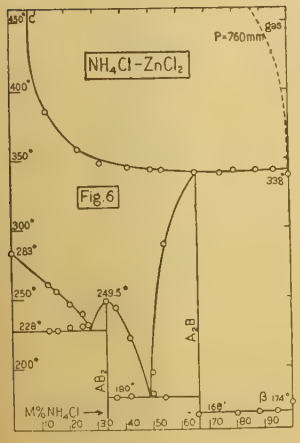
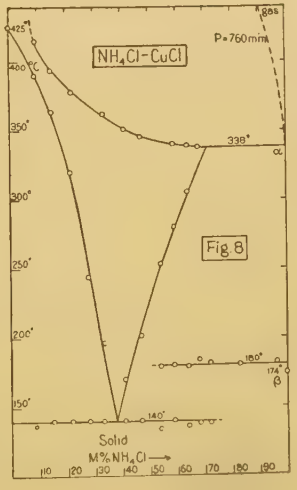
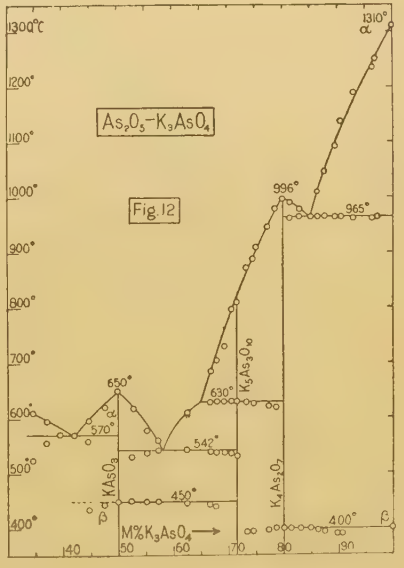


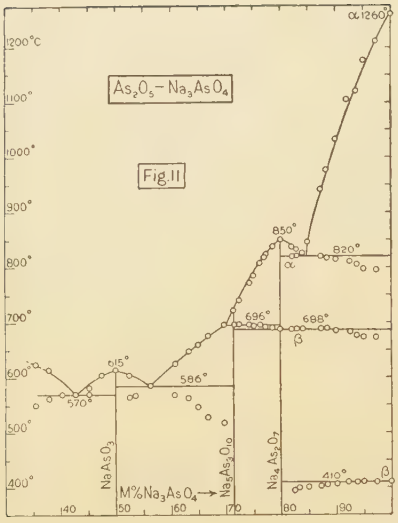
Fig. 4
$NH_3$-$NH_4Br$
mm. Hg
t°C

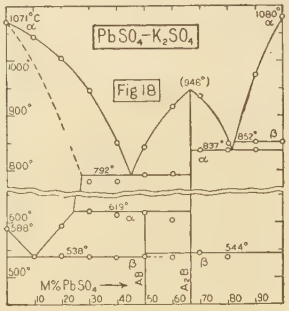

$NH_4NO_3$-$TlNO_3$
Fig. 5
Solid
M% $TlNO_3$

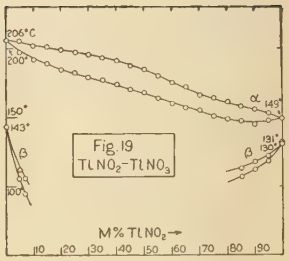

$NH_4Cl$-$ZnCl_2$
P=760mm
Fig. 6
M% $NH_4Cl$

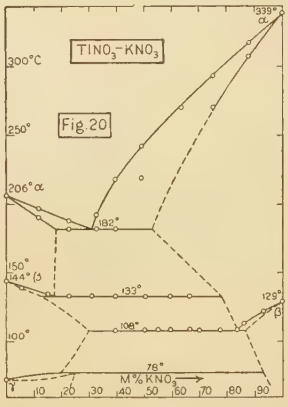

$NH_4Cl$-CuCl
P=760mm
Fig. 8
Solid
M% $NH_4Cl$

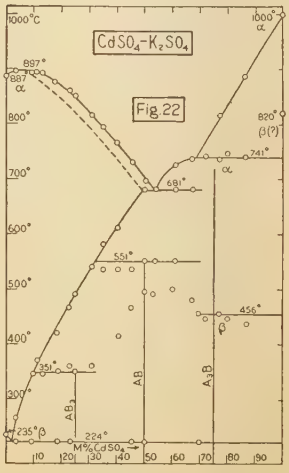

$As_2O_5$-$K_3AsO_4$
Fig. 12
M% $K_3AsO_4$

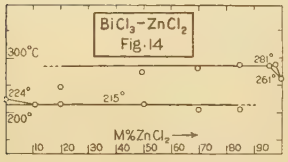

$As_2O_5-Na_3AsO_4$
Fig. 11
M% $Na_3AsO_4$
$Na_3AsO_3$
$Na_3As_3O_{10}$
$Na_4As_2O_7$

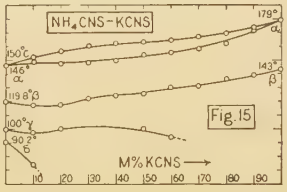

$PbSO_4-K_2SO_4$
Fig. 18
M% $PbSO_4$


$TlNO_2-TlNO_3$
Fig. 19
M% $TlNO_2$


$TlNO_3-KNO_3$
Fig. 20
M% $KNO_3$


$CdSO_4-K_2SO_4$
Fig. 22
M% $CdSO_4$


$BiCl_3-ZnCl_2$
Fig. 14
M% $ZnCl_2$


$NH_4CNS-KCNS$
Fig. 15
M% KCNS

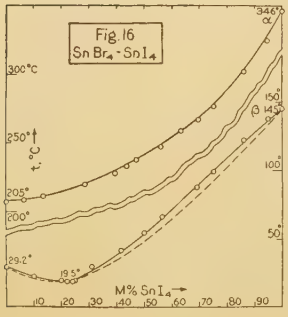
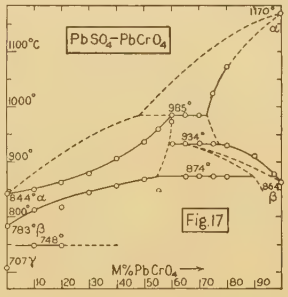
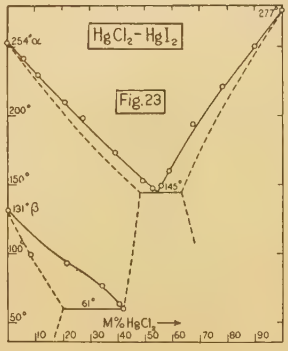
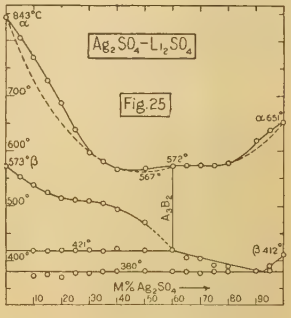
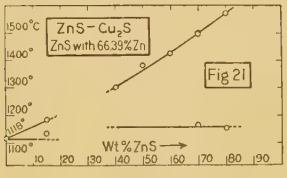


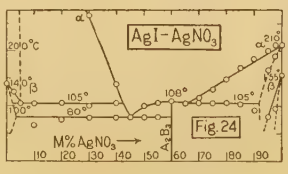
Fig. 16
$SnBr_4-SnI_4$
M% $SnI_4$

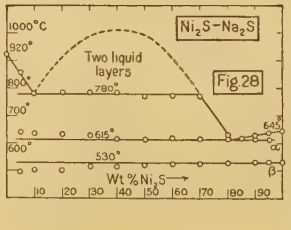

$PbSO_4-PbCrO_4$
Fig. 17
M% $PbCrO_4$


$HgCl_2-HgI_2$
Fig. 23
M% $HgCl_2$


$Ag_2SO_4-Li_2SO_4$
Fig. 25
M% $Ag_2SO_4$


ZnS – $Cu_2S$
ZnS with 66.39% Zn
Fig. 21
Wt % ZnS


AgI – $AgNO_3$
Fig. 24
M% $AgNO_3$


$Ni_2S-Na_2S$
Two liquid layers
Fig. 28
Wt % $Ni_2S$

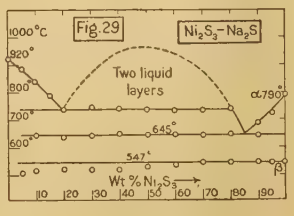
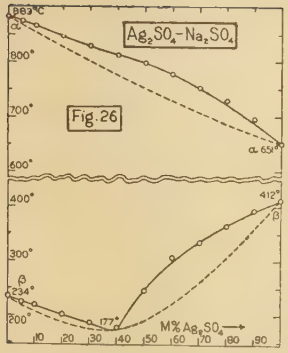
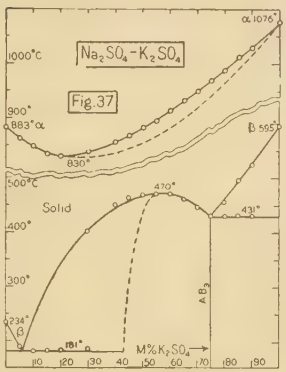
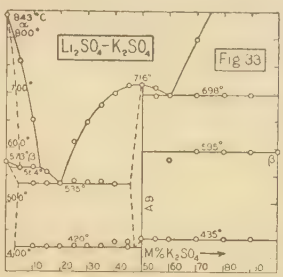
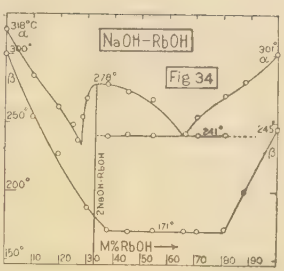


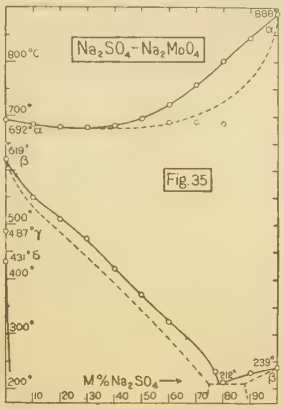
Fig. 29
$Ni_2S_3-Na_2S$
Two liquid layers
Wt % $Ni_2S_3$

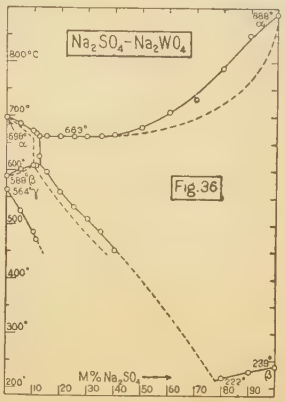

$Ag_2SO_4-Na_2SO_4$
Fig. 26
M% $Ag_2SO_4$

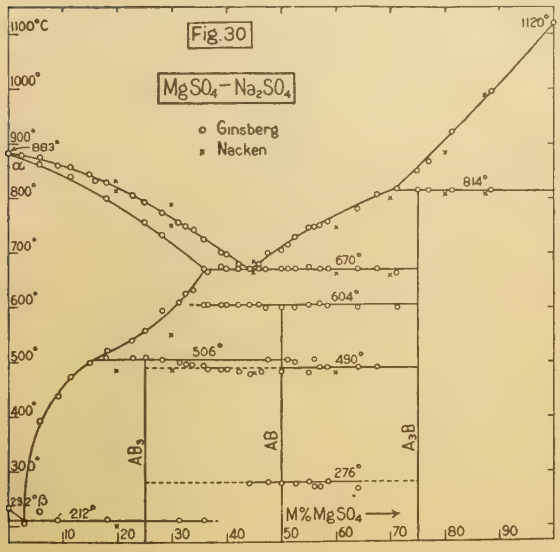

$Na_2SO_4-K_2SO_4$
Fig. 37
Solid
M% $K_2SO_4$

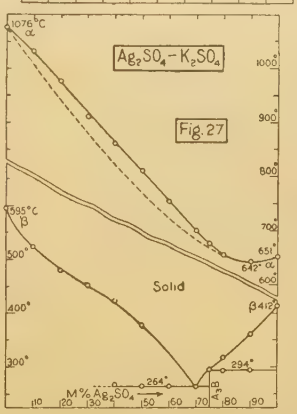

$Li_2SO_4-K_2SO_4$
Fig. 33
M% $K_2SO_4$

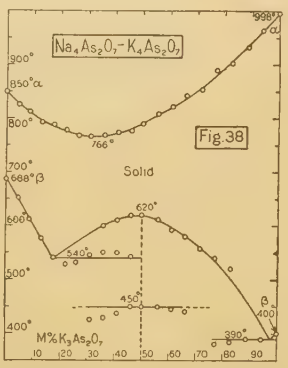

NaOH-RbOH
Fig. 34
M% RbOH

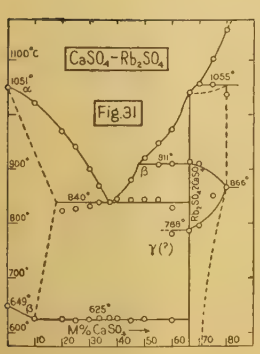

$Na_2SO_4-Na_2MoO_4$
Fig. 35
M% $Na_2SO_4$

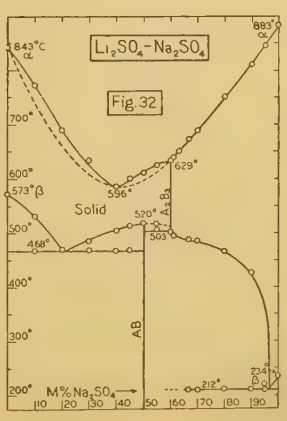

$Na_2SO_4-Na_2WO_4$
Fig. 36
M% $Na_2SO_4$

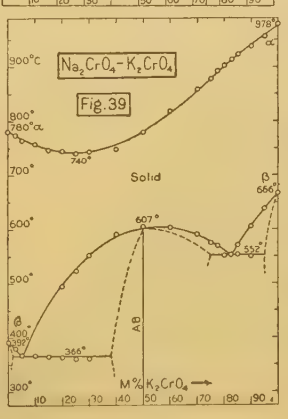

$MgSO_4-Na_2SO_4$
Fig. 30
Ginsberg
Nacken
M% $MgSO_4$

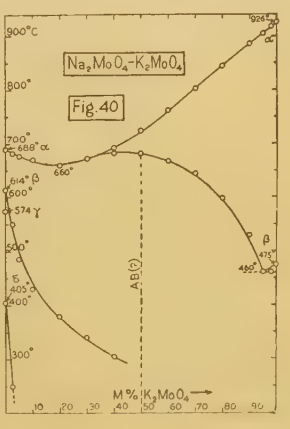

$Ag_2SO_4-K_2SO_4$
Fig. 27
Solid
M% $Ag_2SO_4$

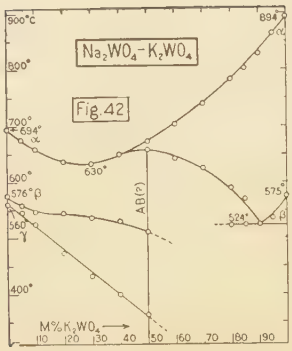

$Na_4As_2O_7-K_4As_2O_7$
Fig. 38
Solid
M% $K_3As_2O_7$

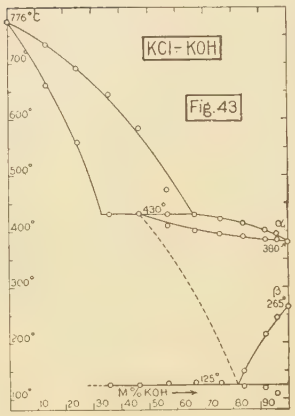

$CaSO_4-Rb_2SO_4$
Fig. 31
M% $CaSO_4$

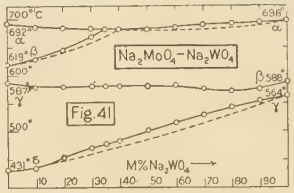

$Li_2SO_4-Na_2SO_4$
Fig. 32
Solid
M% $Na_2SO_4$

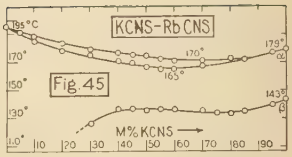

$Na_2CrO_4-K_2CrO_4$
Fig. 39
Solid
M% $K_2CrO_4$

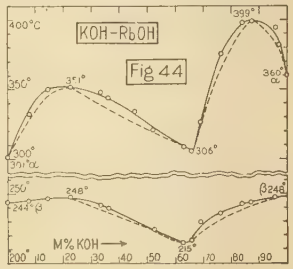

$Na_2MoO_4-K_2MoO_4$
Fig. 40
M% $K_2MoO_4$

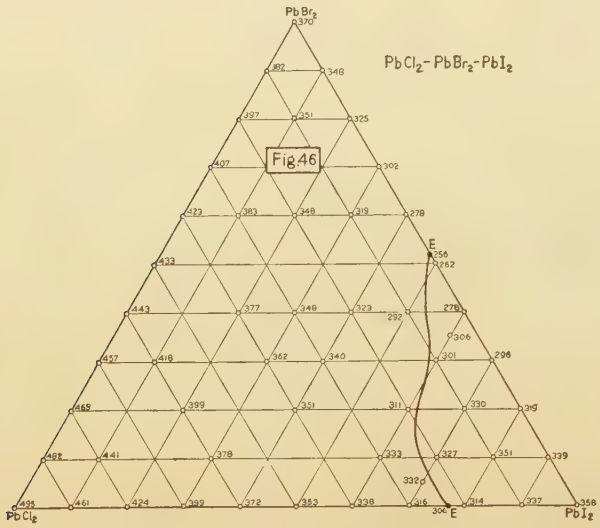

$Na_2WO_4-K_2WO_4$
Fig. 42
M% $K_2WO_4$

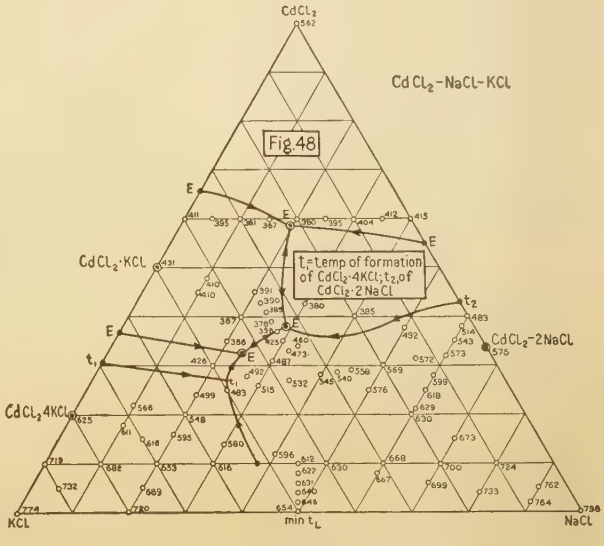

KCl-KOH
Fig. 43
M% KOH

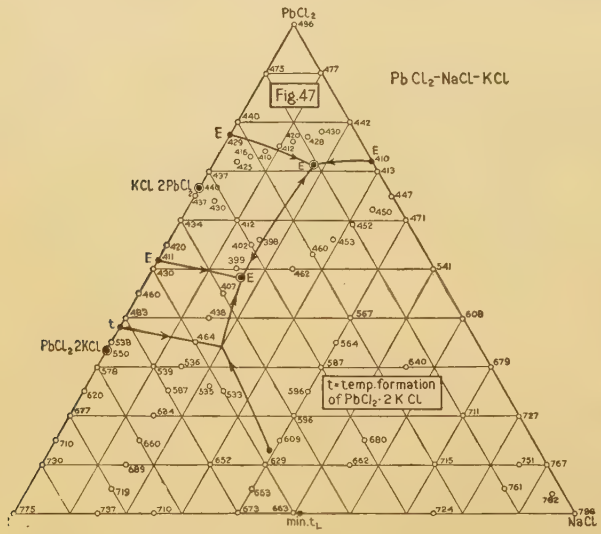

$Na_2MoO_4-Na_2WO_4$
Fig. 41
M% $Na_2WO_4$

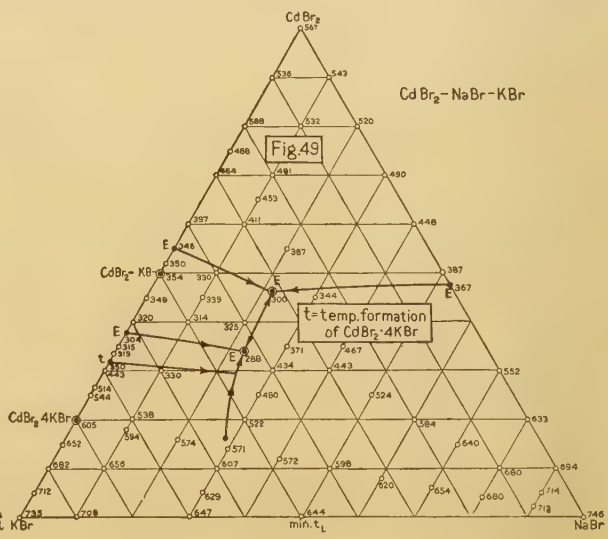

KCNS-RbCNS
Fig. 45
M% KCNS

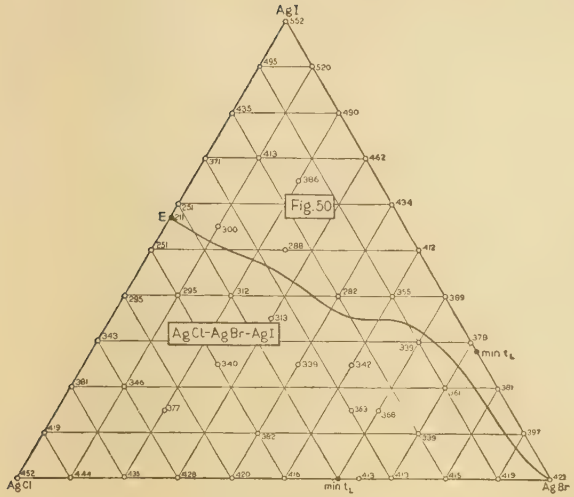

KOH-RbOH
Fig. 44
M% KOH

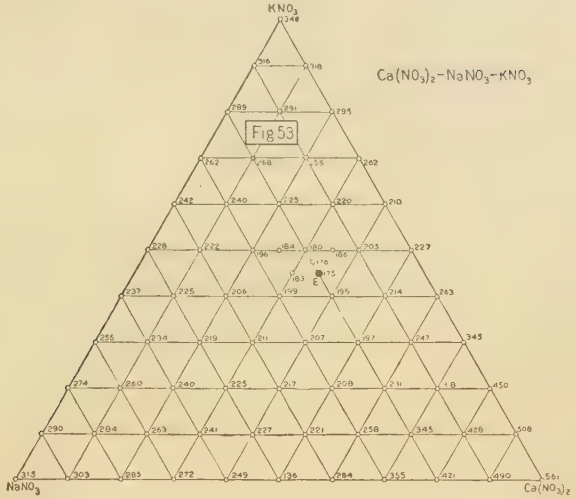

$PbCl_2-PbBr_2-PbI_2$
Fig. 46
$PbCl_2$
$PbI_2$

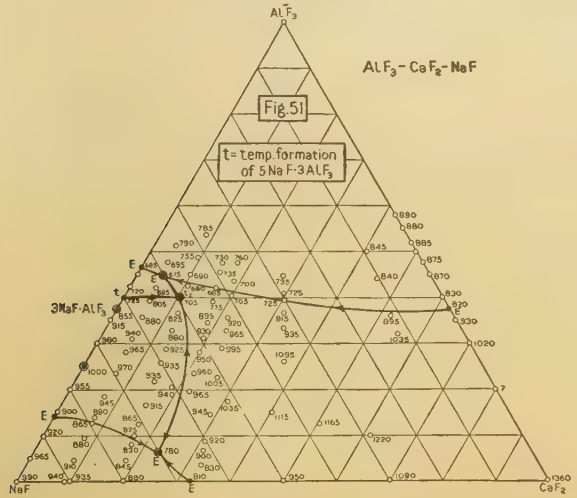

$CdCl_2-NaCl-KCl$
Fig. 48
$CdCl_2 \cdot KCl$
$CdCl_2 \cdot 2NaCl$
$CdCl_2 \cdot 4KCl$
t=temp of formation of $CdCl_2 \cdot 4KCl$; $t_2$ of $CdCl_2 \cdot 2NaCl$
KCl
NaCl
min $t_L$

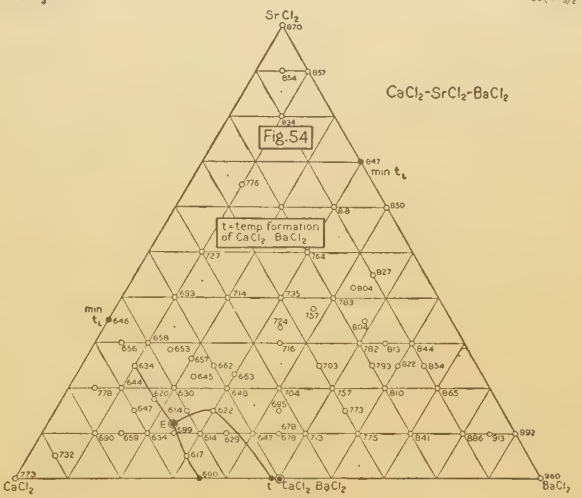

$PbCl_2-NaCl-KCl$
Fig. 47
$KCl\ 2PbCl_2$
$PbCl_2 2KCl$
t=temp. formation of $PbCl_2 \cdot 2KCl$
NaCl
min $t_L$

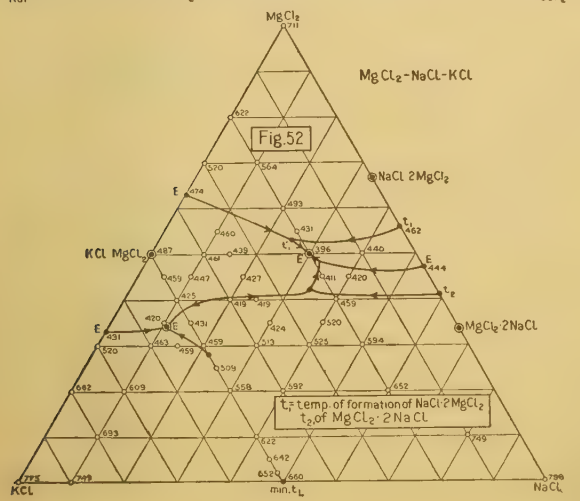

$CdBr_2-NaBr-KBr$
Fig. 49
$CdBr_2-KBr$
$CdBr_2 4KBr$
t=temp. formation of $CdBr_2 \cdot 4KBr$
KBr
NaBr
min $t_L$

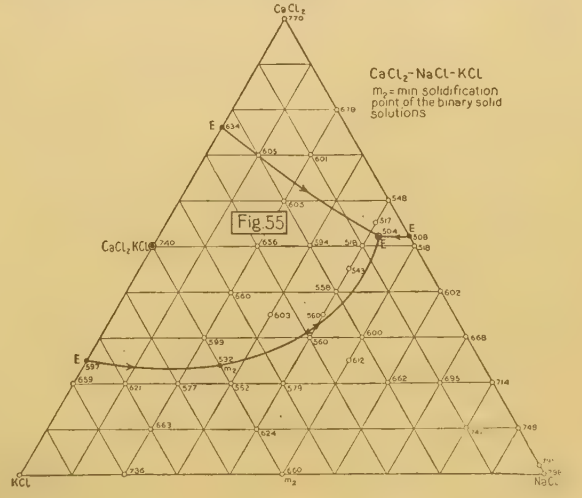

AgI
AgCl
AgBr
Fig. 50
AgCl-AgBr-AgI
min $t_L$

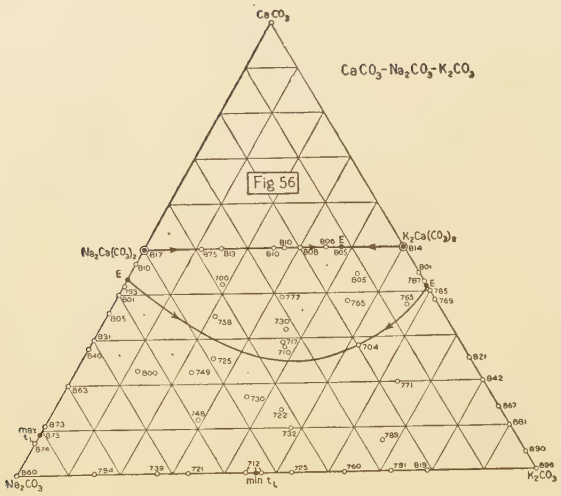

$KNO_3$
$NaNO_3$
$Ca(NO_3)_2$
$Ca(NO_3)_2-NaNO_3-KNO_3$
Fig. 53

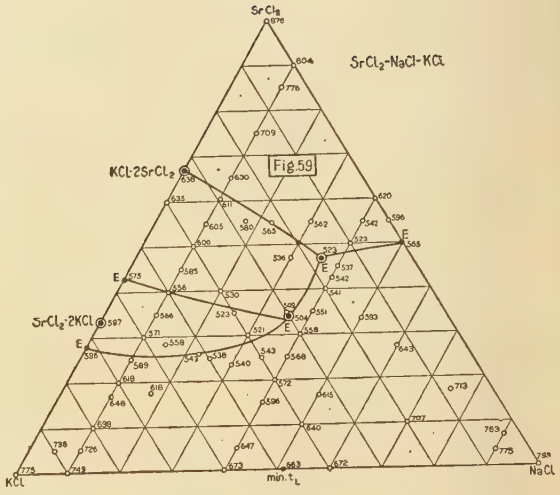

$AlF_3$
NaF
$CaF_2$
$AlF_3-CaF_2-NaF$
Fig. 51
t= temp. formation of $5NaF\cdot 3AlF_3$
$3NaF\cdot AlF_3$

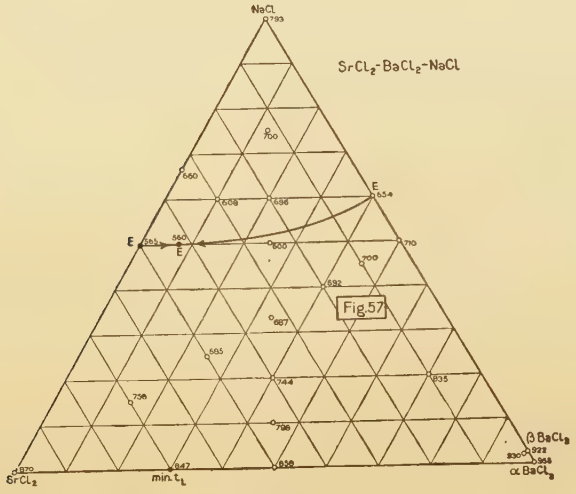

$SrCl_2$
$CaCl_2$
$BaCl_2$
$CaCl_2-SrCl_2-BaCl_2$
Fig. 54
min $t_L$
t= temp formation of $CaCl_2$ $BaCl_2$

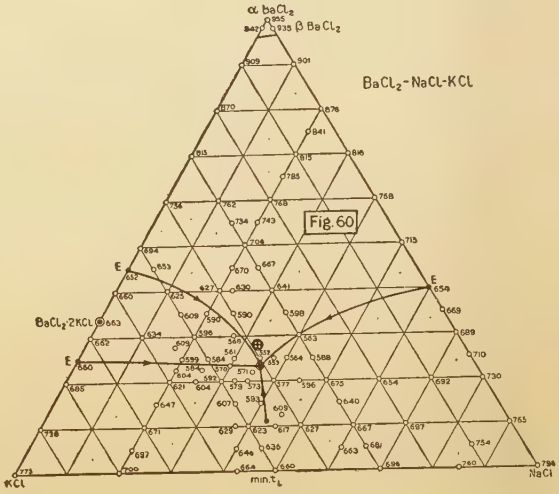

$MgCl_2$
KCl
NaCl
$MgCl_2-NaCl-KCl$
Fig. 52
$NaCl\ 2MgCl_2$
$KCl\ MgCl_2$
$MgCl_2\ 2NaCl$
$t_1$= temp. of formation of $NaCl\ 2MgCl_2$
$t_2$ of $MgCl_2\ 2NaCl$
min $t_L$

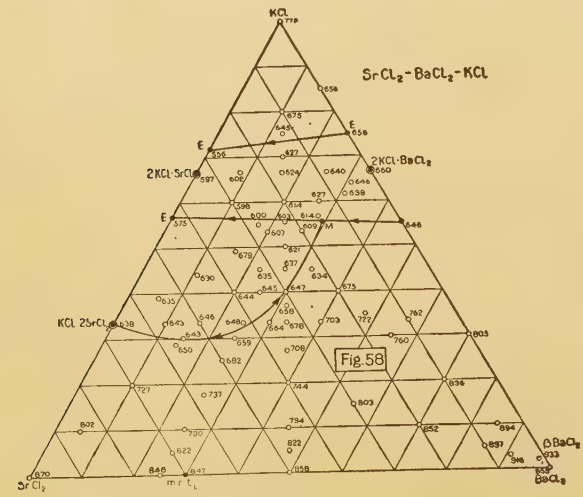

$CaCl_2$
KCl
NaCl
$CaCl_2-NaCl-KCl$
$m_1$= min solidification point of the binary solid solutions
Fig. 55
$CaCl_2\ KCl$

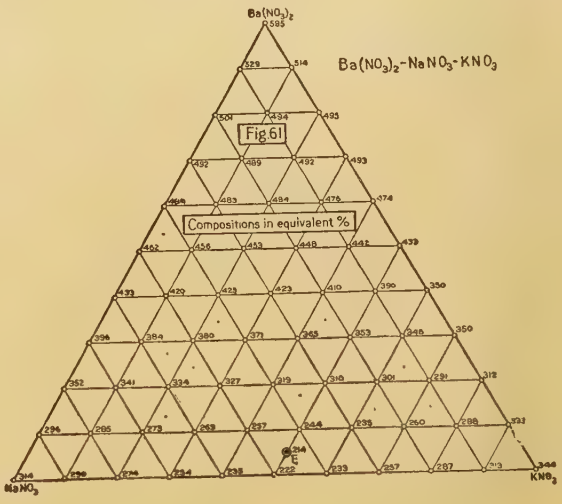

$CaCO_3$
$CaCO_3$-$Na_2CO_3$-$K_2CO_3$
Fig 56
$Na_2Ca(CO_3)_2$
$K_2Ca(CO_3)_2$
E
min $t_L$
$Na_2CO_3$
$K_2CO_3$

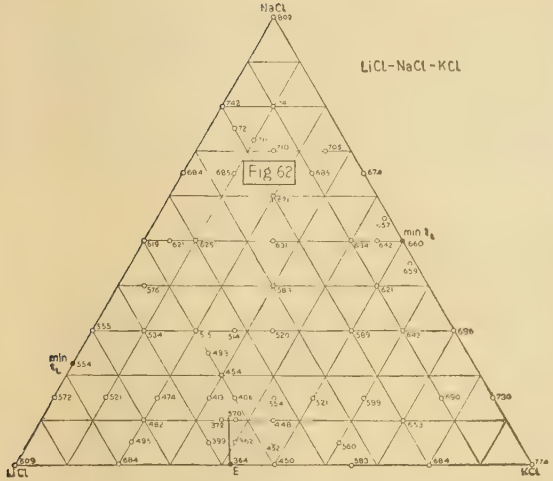

$SrCl_2$
$SrCl_2$-NaCl-KCl
Fig.59
KCl·2$SrCl_2$
$SrCl_2$·2KCl
E
min $t_L$
KCl
NaCl

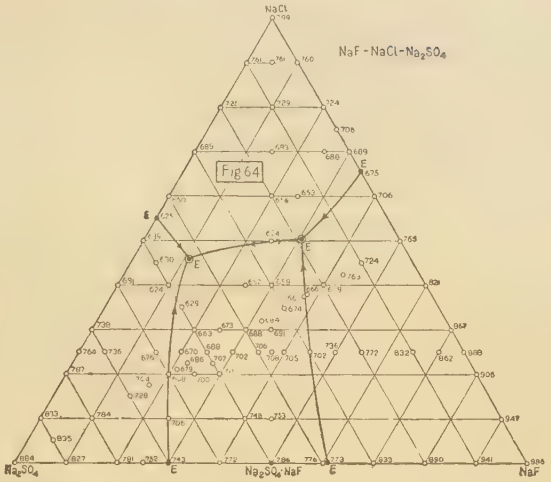

NaCl
$SrCl_2$-$BaCl_2$-NaCl
Fig.57
E
min $t_L$
$SrCl_2$
β $BaCl_2$
α $BaCl_2$

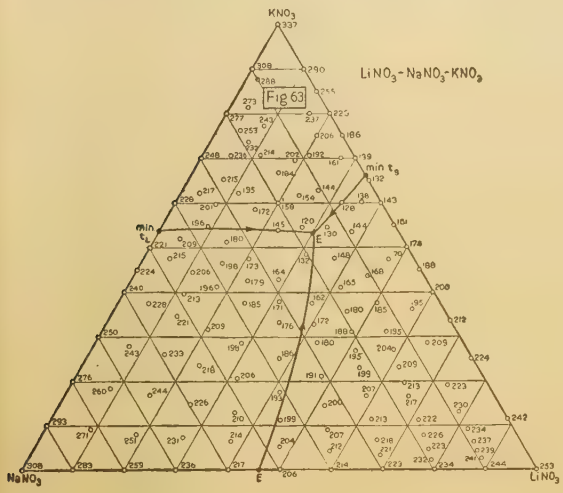

α $BaCl_2$
β $BaCl_2$
$BaCl_2$-NaCl-KCl
Fig. 60
$BaCl_2$·2KCl
E
min $t_L$
KCl
NaCl


KCl
$SrCl_2$-$BaCl_2$-KCl
2KCl·$SrCl_2$
2KCl·$BaCl_2$
KCl·2$SrCl_2$
Fig.58
E
min $t_L$
$SrCl_2$
β $BaCl_2$
$BaCl_2$


$Ba(NO_3)_2$
$Ba(NO_3)_2$-$NaNO_3$-$KNO_3$
Fig.61
Compositions in equivalent %
E
$NaNO_3$
$KNO_3$




(230) Sandonnini and Scarpa, *22*, **22 II**: 163; 13. (231) Sandonnini and Scarpa, *22*, **22 II**: 517; 13. (232) Sanger and Riegel, *93*, **76**: 79; 12. (233) Scarpa, *22*, **21 II**: 719; 12. (234) Scarpa, *22*, **22 II**: 452; 13. (235) Scarpa, *22*, **24 I**: 738; 15. (236) Scarpa, *22*, **24 I**: 955; 15. (237) Scarpa, *22*, **24 II**: 476; 15. (238) Schaefer, *190*, **1914 I**: 15. (239) Schaefer, *Diss.*, Berlin, 1919.

(240) Schenck and Rassbach, *25*, **41**: 2917; 08. (241) Schobert, *Diss.*, Leipzig, 1912. (242) Schoen, *192*, **8**: 737; 10. (243) Scholich, *Diss.*, Berlin, 1919. (244) Skossarewsky and Tchitchinadzé, *42*, **14**: 153; 16. (245) Smolenskii, *93*, **73**: 293; 12. (246) Steger, *7*, **43**: 595; 03. (247) Stock and Rudolph, *25*, **43**: 150; 10. (248) Tacchini, *36*, **54**: 777; 24. (249) Takahashi, *429*, **4**: 47; 19.

(250) Tammann and Krings, *93*, **130**: 229; 23. (251) Thiel and Schulte, *7*, **96**: 312; 20. (252) Thomas, *192*, **7**: 706; 10. (253) Tolloczko, *7*, **30**: 705; 99. (254) Tolloczko, *165*, **1**: 1; 01. (255) Treis, *190B*, **37**: 766; 14. (256) Truthe, *93*, **76**: 129; 12. (257) Tubandt and Eggert, *93*, **110**: 196; 20. (258) Ussow, *93*, **38**: 419; 04. (259) Vasil'ev, *53*, **44**: 1076; 10.

(260) Vogt, *190*, **1914 II**: 14. (261) Voloskov, *169*, **15**: 428; 11. (262) Vortisch, *190B*, **38**: 185; 14. (263) Vortisch, *190B*, **38**: 513; 14. (264) Vrzhesneskii, *93*, **74**: 95; 12. (265) Wagemann, *192*, **9**: 518; 08. (266) Walden, *93*, **29**: 371; 02. (267) Walden, *93*, **68**: 307; 10. (268) Walden and Centnerszwer, *7*, **42**: 432; 03. (269) Welsh and Broderson, *1*, **37**: 816; 15.

(270) Winter, *Diss.*, Leipzig, 1913. (271) Wise, *1*, **45**: 1233; 23. (272) von Wittorff, *93*, **41**: 85; 04. (273) Wolters, *190B*, **30**: 55; 10. (274) Zambonini, *508*, **45/46**: 3; 15. (275) Zambonini, *36*, **50 II**: 128; 20. (276) von Zawidski, *7*, **47**: 721; 04. (277) Zhemchuzhnui, *93*, **57**: 267; 08. (278) Zhemchuzhnui, *93*, **65**: 403; 10. (279) Zhemchuzhnui, *93*, **153**: 47; 26.

(280) Schmidt, *27*, **39**: 1686; 29. (281) Beach and Bond, *453*, **32**: 328; 25.

# SYSTEMS CONTAINING REFRACTORY SUBSTANCES

John Bright Ferguson*

## Introduction

*Scope.*—The substances included in this section are boron nitride, the oxides of Al, Fe, Si, Ti, Th, Ce, Zr, the alkaline earths and the rare earths. The systems covered consist of these substances alone, associated with one another, or associated with any metallic oxide, exclusive of tungstates, vanadates, and molybdates.

## Introduction

*Champ.*—Les substances comprises dans cette section sont: le nitrure de bore, les oxydes d'Al, Fe, Si, Ti, Th, Ce, Zr, les terres alcalines et les terres rares. Les systèmes mentionnés consistent en ces substances seules, associées l'une avec l'autre ou associées à un oxyde métallique, à l'exclusion des tungstates, vanadates et molybdates.

## Einleitung

*Umfang.*—Die in diesem Abschnitt enthaltenden Stoffe sind, Bornitrid, die Oxyde des Al, Fe, Si, Ti, Th, Ce, Zr, der alkalischen und seltenen Erden. Die dargestellten Systeme behandeln diese Stoffe allein oder in Verbindung mit einander, oder in Verbindung mit irgend einem Metalloxyd. Ausgenommen sind Wolframate, Vanadate und Molybdate.

## Introduzione

*Contenuto.*—Le sostanze considerate in questa sezione sono: azoturo di boro, gli ossidi di Al, Fe, Si, Ti, Th, Ce, Zr, quelli dei metalli alcalino-terrosi e delle terre rare. I sistemi presi in considerazione con un ossido metallico qualunque. Sono eccettuati i tungstati, i vanadati ed i molibdati.

* Data marked Ed. added by editorial office.

*Bibliography.—See* (7, 8, 52).

*Temperature Scale.*—The temperature scale employed is the I. C. T. scale (*see* Vol. I, p. 53) with *slightly different values* for certain fixed points as follows: diopside, 1391°; Pd, 1550°.

*Bibliographie.—Voir* (7, 8, 52).

*Échelle de température.*—L'échelle de température employée est l'échelle des T. C. I. (*voir*, Vol. I, p. 53) avec des *valeurs légèrement différentes* pour les points fixes suivants: diopside, 1391°; Pd, 1550°.

*Bibliographie.—Siehe* (7, 8, 52).

*Temperaturskala.*—Die zugrunde liegende Skala ist die der I. C. T. (*siehe* Band I, S. 53) mit *etwas geringer Abweichung* für die Fixpunkte: Diopsid, 1391°; Pd, 1550°.

*Bibliografica.—Vedi* (7, 8, 52).

*Scala della temperatura.*—La scala adottata è quella delle I. C. T. (*vedi* Vol. I, p. 53), salvo *piccole variazioni* per quanto riguarda i punti fissi: diopside, 1391°; Pd, 1550°.

## ONE-COMPONENT SYSTEMS

Standard Arrangement; *v.* Vol. I, p. 96

MELTING POINTS (m), BOILING POINTS, UNDER 1 ATM. (b), TRANSITION TEMPERATURES (tr.), AND DECOMPOSITION TEMPERATURES (d)

| | | |
|---|---|---|
| 18 | $SiO_2$; *v.* p. 19 | |
| 19 | $TiO_2$ | Several forms (106); decomposes into $2Ti_2O_3.3TiO_2$ (122); for M. P. of $Ti_2O$, *v.* (54) |
| | $2Ti_2O_3.3TiO_2$ | m, 1640 (122) |
| | $ZrO_2$ | Several forms (106); m, 2700 (146), 3000 (109), 2550–2600 (120, 122, 142); yield point of fused material 2950 (23) |
| | $ZrO_2.SiO_2$ | m, 2550 (94, 146) |
| | PbO | m, 888 ± 10 (30) |
| | $PbO.SiO_2$ | m, 766 ± 10 (29, 30) |
| | $2PbO.SiO_2$ | m, 746 ± 10 (29, 30) |
| | $ThO_2$ | m, >2790 (120, 142) |
| 3 | ZnO | m, 1975 (157) (Ed.) |
| | $ZnO.SiO_2$ | m, 1437 ± 2 (80, 81) |
| | $2ZnO.SiO_2$ | m, 1509 ± 3 (80, 81) |
| | $CdO.SiO_2$ | m, 1242 ± 2 (80, 81) |
| | $2CdO.SiO_2$ | m, 1242 ± 2 (80, 81) |
| | MnO | m, >1650 *in vacuo* (142) |
| | $MnO.SiO_2$ | m, 1273 ± 5; heat effects at 1208 and 1120°; interpretation not clear (40, 56, 80, 81) |
| | 2MnO.SiO | Probably decomposes into MnO + liq., 1323 (40, 80) |
| 43 | FeO | Stability range >570; relations uncertain; *see* binary system $FeO-Fe_3O_4$; magnetic form (47); M. P. of a ferrous oxide, 1419 (58, 118) |
| | $Fe_2O_3$ | tr., 678, probable tr., 755–85 (110, 137); magnetic tr., 40 (73); *cf.* (140); in air d, 1100; $p_{O_2}$ = *ca.* 1 atm. at 1200 (67, 74, 117, 144); m, 1548–65d (58, 89, 118); *see* binary system $Fe_2O_3-Fe_3O_4$ |
| | $Fe_3O_4$ | Magnetic tr., 530 (6, 31, 124, 135, 136, 149, 155); m, 1538d (58, 118); $p_{O_2}$, 1100° <0.005 mm (74); 1200° <0.04 mm (137); *see* binary system $Fe_2O_3-Fe_3O_4$ |
| | $2FeO.SiO_2$ | (87) |
| | $Cr_2O_3$ | m, 1990 ± 20 (58, 86, 118) |
| | $Ta_2O_5$ | Dissociates into lower oxide which melts about 1460–80 (142) |
| | BN | d, 1222–1240; $p_{N_2}$ ≯9.4 mm (130, 131); probably two forms (53) |
| | $Al_2O_3$ | Two forms; probably monotropic (111); m, α, 2050 ± 10 (86, 118, 120, 142); b, 2210 (Ar) (121) |
| | (For borates, *v.* (62, 63) | |
| | $Al_2O_3.SiO_2$ | Unstable forms (22, 59) |
| | $3Al_2O_3.2SiO_2$ | Mullite; d (into liq. + $\alpha Al_2O_3$) 1810 ± 10 (20, 59, 60); *see* binary system |
| 57 | $Yt_2O_3$ | m, 2410 (120) |
| | $La_2O_3$ | m, >2000 (142) |
| | $Ce_2O_3$ | m, 1692 (54) |
| | BeO | m, 2400 ± 50 (119, 122, 142) |
| | $BeO.SiO_2$ | m, >1755 (80, 81) |
| 76 | MgO | m, 2800 ± 20 (86, 120); b, 2800 (neutral atm.) (121); b, 2029 at 7 mm (118); one form only (108) |
| | $MgO.SiO_2$ | Clinoenstatite stable high temp. form; d (into $2MgO.SiO_2$ + liq.) 1557 ± 2: 3 unstable forms (1, 3, 19, 37, 38, 150) |
| | $2MgO.SiO_2$ | m, 1890 ± 20 (19) |
| | $MgO.Al_2O_3$ | m, 2135 ± 20 (111, 128) |
| | $2MgO.2Al_2O_3.5SiO_2$ | Two forms, monotropic; d (112); *see* ternary system |
| 77 | CaO | Two forms—tr., *ca.* 420 (135, 138); m, 2572 ± 10 (86, 125); b, 2850 (118, 121) |
| | $CaO.SiO_2$ | α (pseudowollastonite); β (wollastonite); $\alpha \rightleftarrows \beta$ 1200 ± 2 (1, 113); m, 1540 ± 2 (2, 37, 38, 113) |
| | $2CaO.SiO_2$ | Stable system—$\alpha \rightleftarrows \beta$ 1420 ± 2; $\beta \rightleftarrows \gamma$ 675 ± 5; α m, 2130 ± 20; for labile system, *v.* (33, 34, 35, 37, 38, 113) |
| | $3CaO.SiO_2$ | d (into CaO + $\alpha 2CaO.SiO_2$) 1900 ± 20 (113, 129); *see* binary system |
| | $3CaO.2SiO_2$ | d (into $2CaO.SiO_2$ + liq.) 1475 ± 5 (113); *see* binary system |
| | $CaO.Fe_2O_3$ | d (into $2CaO.Fe_2O_3$ + liq.) 1216 ± 5 (139); *see* binary system |
| | $2CaO.Fe_2O_3$ | d (into CaO + liq.) 1436 ± 5 (139); *see* binary system |
| | $2CaO.B_2O_3$ | m, 1304 ± 5 (63, 115) |
| | $CaO.Al_2O_3$ | m, 1600 ± 5 (38, 113, 128) |
| | $3CaO.Al_2O_3$ | d (into CaO + liq.) 1535 ± 5 (38, 113, 128); *see* binary system |
| | $3CaO.5Al_2O_3$ | Two forms, monotropic, stable form m, 1720 ± 10 (38, 113, 128) |
| | $5CaO.3Al_2O_3$ | Two forms, monotropic, stable form m 1455 ± 5 (38, 113, 128) |
| | $CaO.Al_2O_3.2SiO_2$ | m, 1550 ± 2 (9, 10, 32, 36, 37, 38, 113) |
| | $2CaO.Al_2O_3.SiO_2$ | m, 1590 ± 2 (48, 113) |
| | $3CaO.Al_2O_3.SiO_2$ | Pure compound not obtained (113) |
| | $CaO.MgO.SiO_2$ | d (into $2CaO.SiO_2$ + solid soln.) 1498 ± 5 (50); *see* ternary system |
| | $CaO.MgO.2SiO_2$ | m, 1391 ± 2 (1, 12, 36, 37, 38) |
| | $2CaO.MgO.2SiO_2$ | m, 1458 ± 2 (48, 50) |
| | $5CaO.2MgO.6SiO_2$ | Existence probable but not certain; d, 1365 ± 5 (50); *see* ternary system |
| 78 | SrO | m, 2430 ± 10 (125); <2570 (42, 97) |
| | $SrO.SiO_2$ | m, 1580 ± 4 (42, 80, 145) |
| | $2SrO.SiO_2$ | m, >1634 (42); probably, >1755 (80) |
| | $SrO.Al_2O_3.2SiO_2$ | m, >1700 (42) |
| 79 | BaO | m, 1923 ± 10 (125) |
| | $BaO.SiO_2$ | m, 1604 ± 5 (42, 80, 81) |
| | $2BaO.SiO_2$ | m, >1755 (42, 80) |

| | | |
|---|---|---|
| 79 | $BaO.2SiO_2$ | m, 1420 ± 4 (15, 16, 42) |
| | $2BaO.3SiO_2$ | m, 1450 ± 2 (42) |
| | $BaO.Al_2O_3.2SiO_2$ | m, >1700 (42) |
| | $BaO.2CaO.3SiO_2$ | d (into $CaO.SiO_2$ + liq.) 1320 ± 4 (42); *see* binary system |
| 81 | $Li_2O$ | m, *ca.* $1710^\circ$; in $O_2$ forms $Li_2O_2$ which attacks platinum; volatile above 1000° (79) |
| | $Li_2O.SiO_2$ | m, 1201 ± 2 (39, 78, 79) |
| | $Li_2O.2SiO_2$ | d (into $Li_2O.SiO_2$ + liq.) 1032 ± 5 (79); *see* binary system |
| | $2Li_2O.SiO_2$ | m, or (probably tr.) 1256 ± 3 (79, 126); *see* binary system |
| | $2Li_2SiO_3.3ZrSiO_3$ | (126) |
| | $Li_2O.Al_2O_3$ | m, >1625 (83) |
| | $Li_2O.Al_2O_3.2SiO_2$ | Two forms; stable form probably pseudoeucryptite, m, 1388 ± 5 (5, 57, 82) |
| | $Li_2O.Al_2O_3.4SiO_2$ | Two forms; stable form β spodumene, m, 1400 ± 3 (5, 82, 83, 96) |
| 82 | $Na_2O.SiO_2$ | m, 1088 ± 2 (78, 101, 145) |
| | $Na_2O.2SiO_2$ | m, 874 ± 2 (101) |
| | $Na_2O.Al_2O_3$ | m, 1650 (94) |
| | $Na_2O.Al_2O_3.2SiO_2$ | Two forms, nephelite ⇄ carnegieite, tr., 1248 ± 5; carnegieite, m, 1526 ± 2 (9, 14); unstable tr., 654–692 and possibly 226.5 (21) |
| | $Na_2O.Al_2O_3.6SiO_2$ | m, 1100 ± 10 (10) |
| | $Na_2O.2CaO.3SiO_2$ | m, 1284 ± 5 (100) |
| | $Na_2O.3CaO.6SiO_2$ | d, at 1047 into $CaO.SiO_2$ + liq. of composition 14CaO, $19Na_2O$, $67SiO_2$ (100) |
| | $2Na_2O.CaO.3SiO_2$ | d, at 1141 ± 5 into $Na_2O.2CaO.3SiO_2$ + liq. of composition 11.5CaO, $38.5Na_2O$, $50SiO_2$ (100) |
| 83 | $K_2O.SiO_2$ | m, 976 (102) |
| | $K_2O.2SiO_2$ | m, 1041 (98, 102, 103, 104) |
| | $K_2O.2TiO_2$ | m, 980 (105) |
| | $K_2O.Al_2O_3.2SiO_2$ | Two forms: tr., 1550 ± 10; m, >1755 (14) |
| | $K_2O.Al_2O_3.6SiO_2$ | d (into $K_2O.Al_2O_3.4SiO_2$ + liq.) 1170 $^{+5}_{-30}$ (99); *see* binary system |

## TWO-COMPONENT SYSTEMS

Standard Arrangement, *v.* Vol. III, p. viii

### Both Components Simple Oxides

| B | Fig. | Lit. and remarks |
|---|---|---|
| | | A = $SiO_2$ |
| $ZrO_2$ | 1 | (146) |
| PbO | 2 | (29, 30, 70, 71, 116, 148) |
| ZnO | 2½ | (157) (Ed.) |
| $Cu_2O$ | | (107); not a true binary (134) |
| MnO | | (25, 40, 61) |
| FeO | | At 1690°C: $L_1$, 3.1%, $L_2$, 40.0%, FeO (61); for phase relations, *v.* (87) |
| CoO | | Two liquids (61) |
| NiO | | Two liquids in high silica melts (61) |
| $Al_2O_3$ | 3 | (20) |
| MgO | 4 | (19, 61) |
| CaO | 5 | (2, 35, 51, 61, 113, 129) |
| SrO | 6 | (42, 61, 80, 92, 133, 141, 145) |
| BaO | 7 | (42, 61, 80) |
| $Li_2O$ | 8 | (79) |
| $Na_2O$ | 9 | (101) |
| $K_2O$ | | (102, 114) |

| A | B | Fig. | Lit. and remarks |
|---|---|---|---|
| $TiO_2$ | MnO | | (25) |
| PbO | $Fe_2O_3$ | | (90) |
| FeO | $Fe_3O_4$ | | Part of system Fe-O. FeO phase stable above 570° ± 10; probably partial solid solution FeO to 24 Wt. % $O_2$ and $Fe_3O_4$ to 27 Wt. % $O_2$ (27, 41, 45, 46, 68, 72, 95, 127, 153, 154) |
| $Fe_2O_3$ | $Fe_3O_4$ | 10 | Part of system Fe-O (74, 90, 132, 137) |
| $Fe_2O_3$ | $Al_2O_3$ | | (26) |
| $Fe_2O_3$ | CaO | 11 | Not a true binary (26, 69, 139) |
| CoO | $Al_2O_3$ | | (65) |
| NiO | MgO | | (66) |
| $B_2O_3$ | CaO | | (63) |
| $B_2O_3$ | SrO | | |
| $B_2O_3$ | BaO | | |
| $Al_2O_3$ | MgO | 12 | (111, 128) |
| $Al_2O_3$ | CaO | 13 | (37, 113, 128) |
| $Al_2O_3$ | $Li_2O$ | | (5) |
| MgO | CaO | | Simple eutectic, *ca.* 33 Wt. % MgO and 2300° (111) |
| CaO | SrO | | X-ray pattern by Wyckoff indicates complete isomorphism (42) |

### One Simple Oxide + A Binary Compound Of Two Oxides

$MgO$-$5CaO.3Al_2O_3$, simple eutectic system; eutectic (Wt. %) 44.7 CaO, 48.8 $Al_2O_3$, 6.5 MgO at 1380° ± 5 (111).

$SiO_2$-$Li_2O.Al_2O_3$ (5).

### One Simple Oxide + A Ternary Compound

$SiO_2$-$CaO.Al_2O_3.2SiO_2$ (4, 113); *v.* Fig. 14.

$SiO_2$-$CaO.MgO.2SiO_2$ (12, 50, 61); *v.* Fig. 15.

$SiO_2$-$K_2O.Al_2O_3.4SiO_2$ (99), *v.* Fig. 16.

$Al_2O_3$-$CaO.Al_2O_3.2SiO_2$; $\alpha Al_2O_3$ melts at 2050° ± 10, $CaO.Al_2O_3.2SiO_2$ at 1550° ± 2; simple eutectic at 1547 $^{+2}_{-5}$ deg. and 19.3 CaO 39.3 $Al_2O_3$, 41.4 $SiO_2$, Wt. % (113).

### Two Binary Compounds

| A | B | Lit. |
|---|---|---|
| $ZrO_2.SiO_2$ | $2Li_2O.SiO_2$ | (126) |
| $ZnO.SiO_2$ | $CdO.SiO_2$ | (88) |
| $ZnO.SiO_2$ | $Li_2O.SiO_2$ | (88) |
| $MnO.SiO_2$ | $MnO.TiO_2$ | (133) |
| $MnO.SiO_2$ | $MgO.SiO_2$ | (92) |
| $2MnO.SiO_2$ | $2MgO.SiO_2$ | (84) |
| $MnO.SiO_2$ | $CaO.SiO_2$ | (56) |
| $2MnO.SiO_2$ | $2CaO.SiO_2$ | (84) |
| $FeO.SiO_2$ | $CaO.SiO_2$ | (91) |
| $2CaO.SiO_2$ | $5CaO.3Al_2O_3$ | (113); *v.* Fig. 17 |
| $2CaO.SiO_2$ | $2Li_2O.SiO_2$ | (126) |
| $CaO.SiO_2$ | $SrO.SiO_2$ | (42); *v.* Fig. 18 |
| $CaO.SiO_2$ | $BaO.SiO_2$ | (42); *v.* Fig. 19 |
| $BaO.2SiO_2$ | $2BaO.3SiO_2$ | (42); *v.* Fig. 20 |
| $Li_2O.SiO_2$ | $Li_2O.B_2O_3$ | (88) |
| $Na_2O.SiO_2$ | $CaO.SiO_2$ | (100) |
| | $Na_2O.WO_3$ | (88) |
| | $Na_2O.B_2O_3$ | (88) |

### One Binary + One Ternary Compound

| Binary | Ternary | Lit. |
|---|---|---|
| $MgO.SiO_2$ | $CaO.Al_2O_3.2SiO_2$ | (4); *v.* Fig. 21 |
| | $CaO.MgO.2SiO_2$ | (12); *v.* Fig. 22 |
| $2MgO.SiO_2$ | $CaO.Al_2O_3.2SiO_2$ | (4); *v.* Fig. 23 |
| | $CaO.MgO.2SiO_2$ | (12); *v.* Fig. 24 |
| $CaO.SiO_2$ | $CaO.Al_2O_3.2SiO_2$ | (113); *v.* Fig. 25 |
| | $2CaO.Al_2O_3.SiO_2$ | (113); *v.* Fig. 26 |
| | $CaO.MgO.2SiO_2$ | (50, 51); *v.* Fig. 27 |
| | $2CaO.MgO.2SiO_2$ | (50); *v.* Fig. 28 |

*Continued on p. 92*

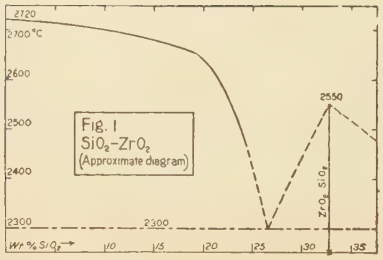


Fig. 1
$SiO_2$–$ZrO_2$
(Approximate diagram)
2720
2700°C
2600
2500
2400
2300
2550
2300
$ZrO_2$·$SiO_2$
Wt % $SiO_2$ →
10
15
20
25
30
35

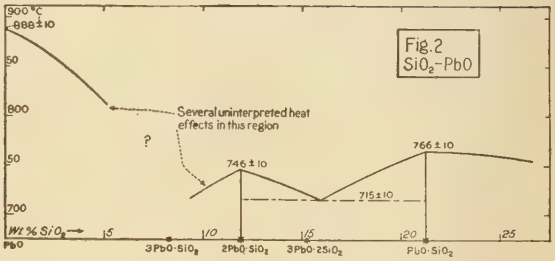


Fig. 2
$SiO_2$–PbO
900°C
888±10
800
700
Several uninterpreted heat effects in this region
?
746±10
715±10
766±10
Wt % $SiO_2$ →
PbO
3PbO·$SiO_2$
2PbO·$SiO_2$
3PbO·2$SiO_2$
PbO·$SiO_2$

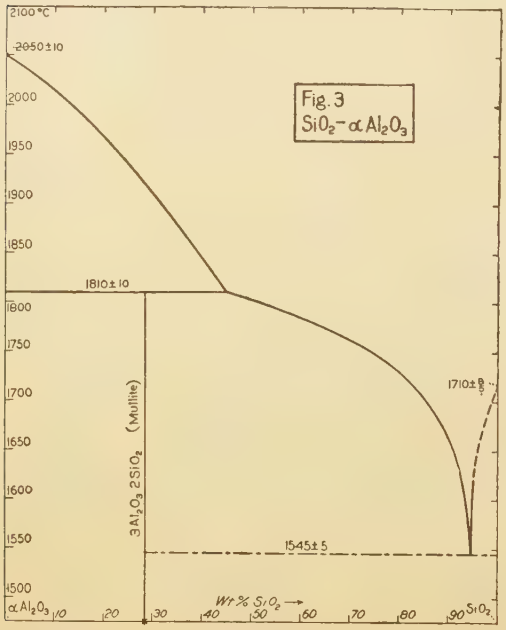


Fig. 3
$SiO_2$–α$Al_2O_3$
2100°C
2050±10
2000
1950
1900
1850
1810±10
1800
1750
1700
1650
1600
1550
1500
1710±5
$3Al_2O_3$·$2SiO_2$ (Mullite)
1545±5
α$Al_2O_3$
Wt % $SiO_2$ →
$SiO_2$

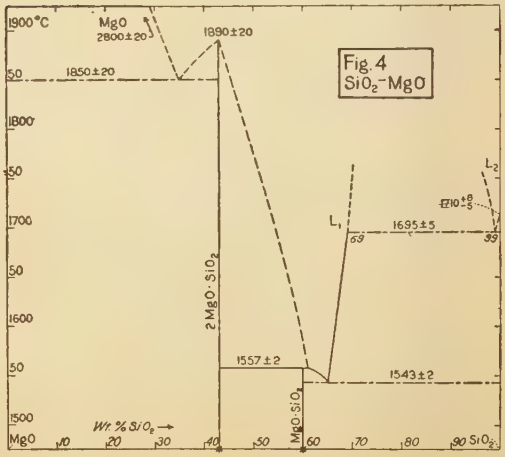


Fig. 4
$SiO_2$–MgO
1900°C
MgO
2800±20
1890±20
1850±20
1800
1700
1600
1500
$L_2$
1710±5
$L_1$
1695±5
68
39
$2MgO·SiO_2$
1557±2
1543±2
MgO·$SiO_2$
Wt % $SiO_2$ →
MgO
$SiO_2$

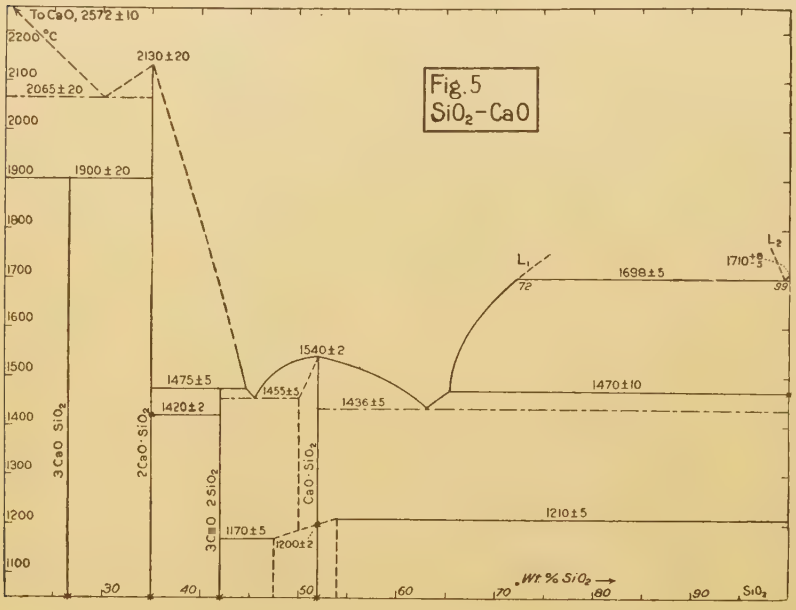


Fig. 5
$SiO_2$–CaO
To CaO, 2572±10
2200°C
2130±20
2065±20
2100
2000
1900
1900±20
1800
1700
1600
1500
1400
1300
1200
1100
$L_2$
1710±5
$L_1$
72
1698±5
39
1540±2
1475±5
1455±5
1420±2
1436±5
1470±10
1210±5
1170±5
1200±2
$3CaO·SiO_2$
$2CaO·SiO_2$
$3CaO·2SiO_2$
$CaO·SiO_2$
Wt % $SiO_2$ →
$SiO_2$

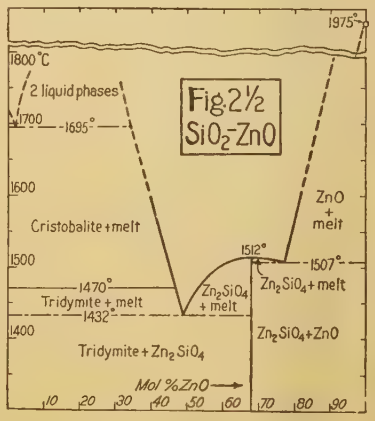


Fig. 2½
$SiO_2$–ZnO
1975°
1800°C
2 liquid phases
1700
1695°
1600
Cristobalite + melt
ZnO
+
melt
1512°
1500
1507°
1470°
$Zn_2SiO_4$ + melt
$Zn_2SiO_4$ + melt
Tridymite + melt
1432°
1400
$Zn_2SiO_4$ + ZnO
Tridymite + $Zn_2SiO_4$
Mol % ZnO →

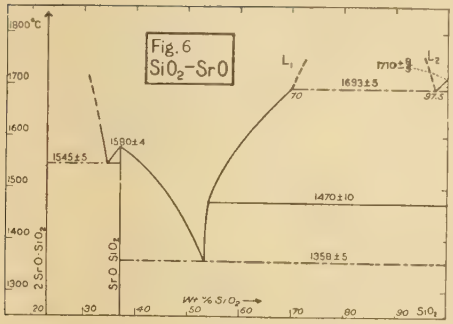


Fig. 6
$SiO_2$–SrO
1545±5
1580±4
1693±5
1470±10
1358±5
Wt % $SiO_2$

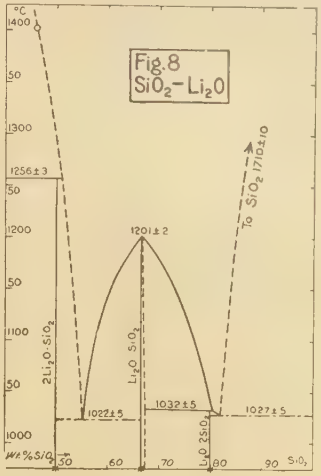


Fig. 8
$SiO_2$–$Li_2O$
1256±3
1201±2
1022±5
1032±5
1027±5
To $SiO_2$ 1710±10
Wt % $SiO_2$

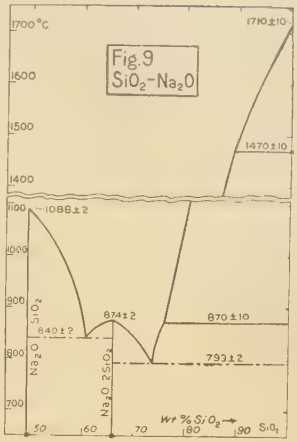


Fig. 9
$SiO_2$–$Na_2O$
1710±10
1470±10
1088±2
874±2
840±?
870±10
793±2
Wt % $SiO_2$

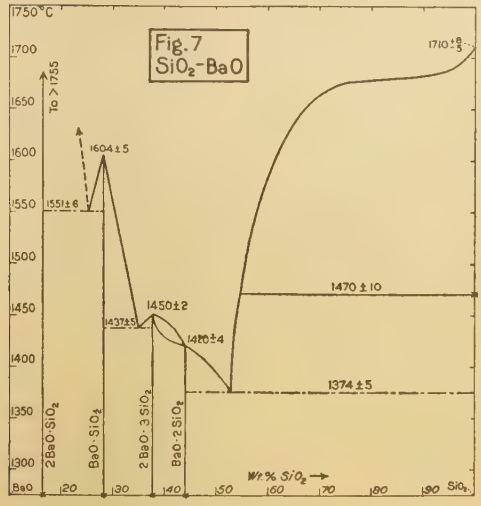


Fig. 7
$SiO_2$–BaO
To >1755
1710±5
1604±5
1551±6
1450±2
1437±5
1420±4
1470±10
1374±5
Wt % $SiO_2$

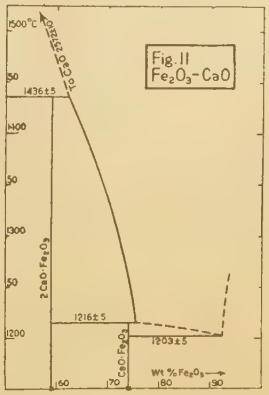


Fig. 11
$Fe_2O_3$–CaO
To CaO 2570±30
1436±5
1216±5
1203±5
Wt % $Fe_2O_3$

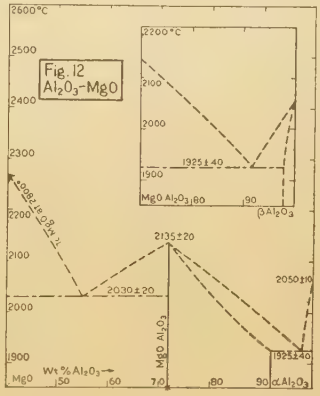


Fig. 12
$Al_2O_3$–MgO
2200°C
1925±40
2135±20
2030±20
2050±10
Wt % $Al_2O_3$

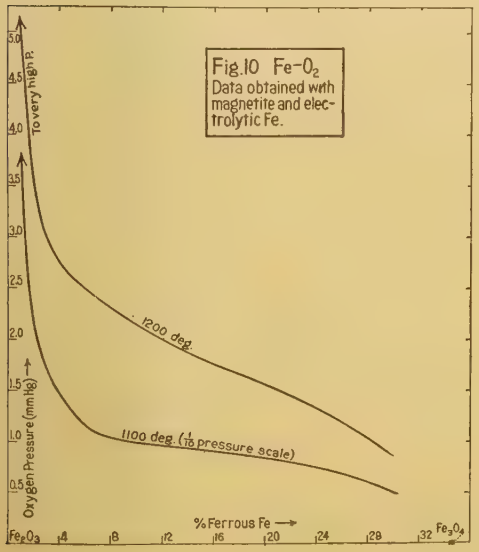


Fig. 10 Fe–$O_2$
Data obtained with magnetite and electrolytic Fe.
To very high P.
1200 deg.
1100 deg. (1/10 pressure scale)
Oxygen Pressure (mm Hg)
% Ferrous Fe
$Fe_2O_3$
$Fe_3O_4$

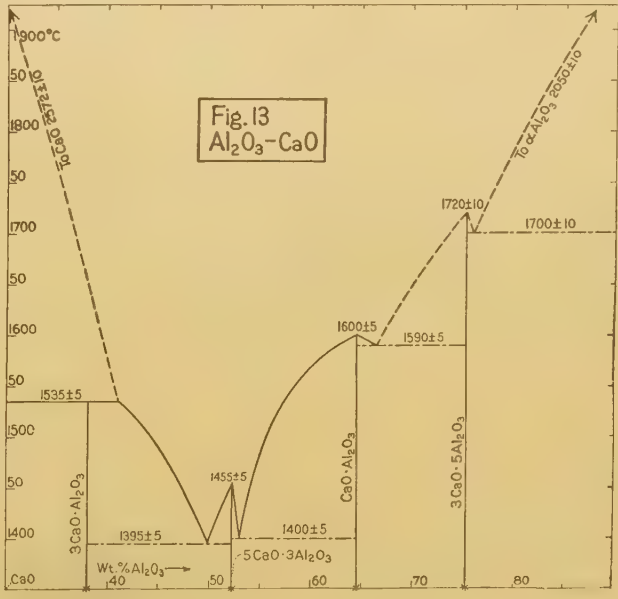


Fig. 13
$Al_2O_3$–CaO
To CaO 2570±30
To $\alpha Al_2O_3$ 2050±10
1720±10
1700±10
1600±5
1590±5
1535±5
1455±5
1400±5
1395±5
$3CaO \cdot Al_2O_3$
$CaO \cdot Al_2O_3$
$3CaO \cdot 5Al_2O_3$
$5CaO \cdot 3Al_2O_3$
Wt % $Al_2O_3$

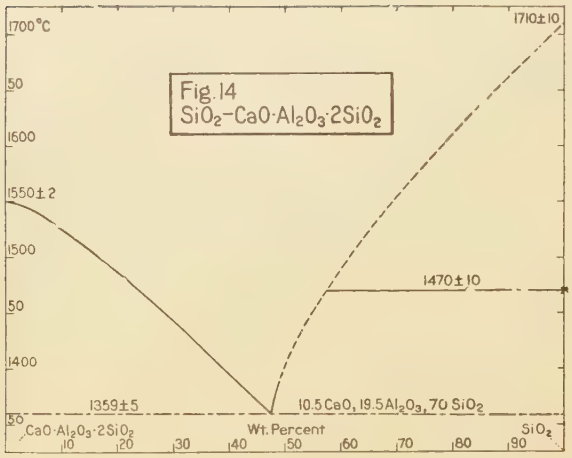


Fig. 14
$SiO_2$–$CaO{\cdot}Al_2O_3{\cdot}2SiO_2$
1700°C
1600
1550±2
1500
1400
1710±10
1470±10
1359±5
10.5 CaO, 19.5 $Al_2O_3$, 70 $SiO_2$
$CaO{\cdot}Al_2O_3{\cdot}2SiO_2$
Wt. Percent
$SiO_2$

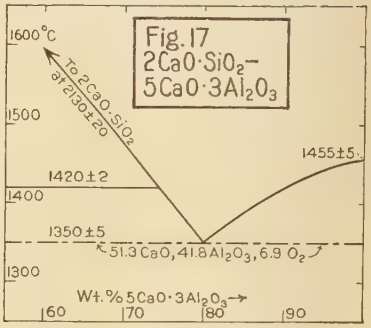


Fig. 17
$2CaO{\cdot}SiO_2$–$5CaO{\cdot}3Al_2O_3$
1600°C
To $2CaO{\cdot}SiO_2$ at 2130±20
1500
1455±5
1420±2
1400
1350±5
51.3 CaO, 41.8 $Al_2O_3$, 6.9 $O_2$
1300
Wt. % $5CaO{\cdot}3Al_2O_3$
60
70
80
90

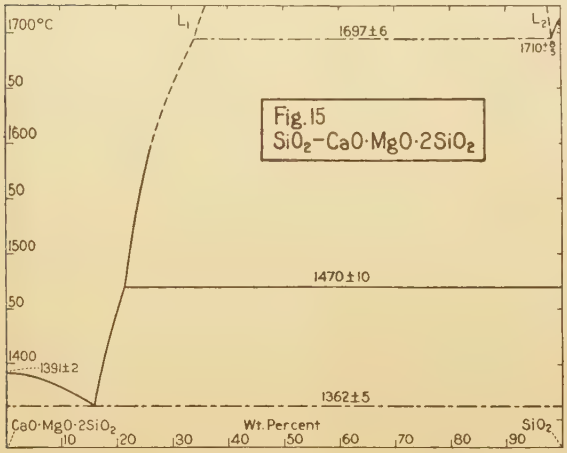


Fig. 15
$SiO_2$–$CaO{\cdot}MgO{\cdot}2SiO_2$
1700°C
$L_1$
$L_2$
1697±6
1710±8/5
1470±10
1391±2
1362±5
$CaO{\cdot}MgO{\cdot}2SiO_2$
Wt. Percent
$SiO_2$

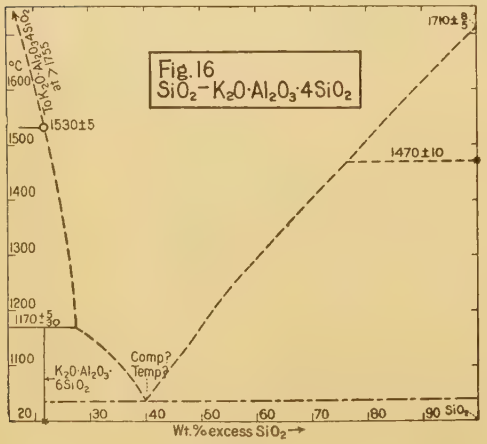


Fig. 16
$SiO_2$–$K_2O{\cdot}Al_2O_3{\cdot}4SiO_2$
1710±8/5
To $K_2O{\cdot}Al_2O_3{\cdot}4SiO_2$ at 1715°
1600
1530±5
1500
1400
1300
1200
1170±5/30
1100
$K_2O{\cdot}Al_2O_3{\cdot}6SiO_2$
Comp? Temp?
20
30
40
50
60
70
80
90 $SiO_2$
Wt. % excess $SiO_2$

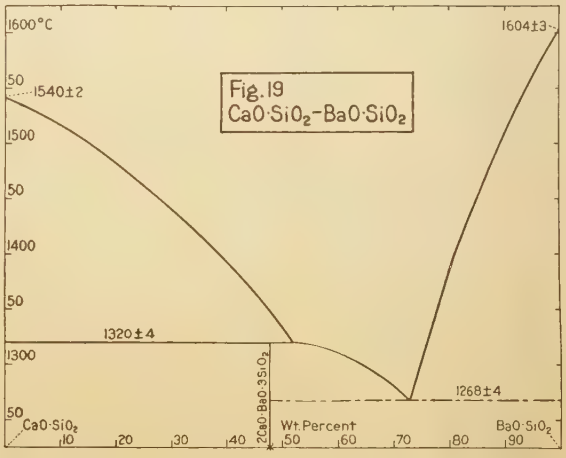


Fig. 19
$CaO{\cdot}SiO_2$–$BaO{\cdot}SiO_2$
1600°C
1604±3
1540±2
1500
1400
1320±4
1300
$2CaO{\cdot}BaO{\cdot}3SiO_2$
1268±4
$CaO{\cdot}SiO_2$
Wt. Percent
$BaO{\cdot}SiO_2$

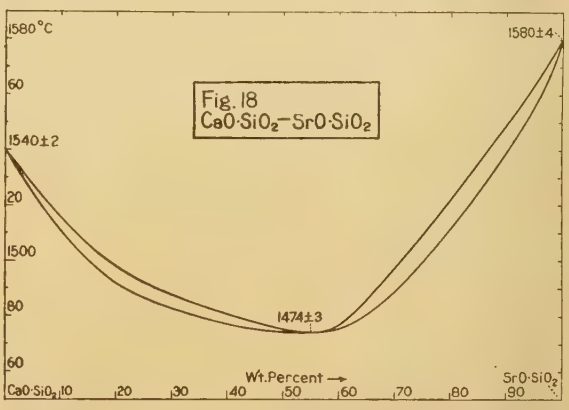


Fig. 18
$CaO{\cdot}SiO_2$–$SrO{\cdot}SiO_2$
1580°C
1580±4
1540±2
1500
1474±3
Wt. Percent
$CaO{\cdot}SiO_2$
$SrO{\cdot}SiO_2$

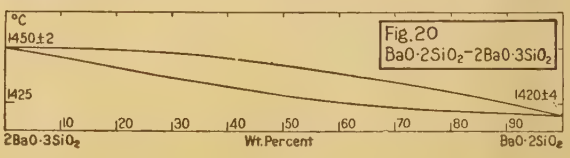


Fig. 20
$BaO{\cdot}2SiO_2$–$2BaO{\cdot}3SiO_2$
°C
1450±2
1425
1420±4
$2BaO{\cdot}3SiO_2$
Wt. Percent
$BaO{\cdot}2SiO_2$

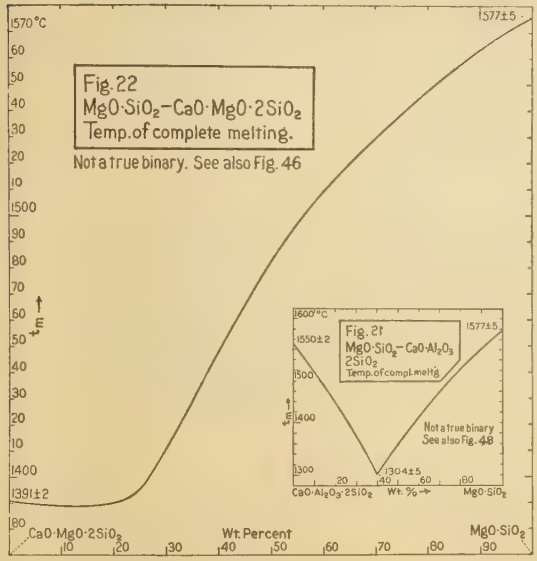


Fig. 22
MgO·SiO2–CaO·MgO·2SiO2
Temp. of complete melting.
Not a true binary. See also Fig. 46
1577±5
1391±2
CaO·MgO·2SiO2
Wt. Percent
MgO·SiO2
Fig. 21
MgO·SiO2–CaO·Al2O3
2SiO2
Temp. of compl. melting
Not a true binary
See also Fig. 48
1304±5
CaO·Al2O3·2SiO2
Wt. %
MgO·SiO2

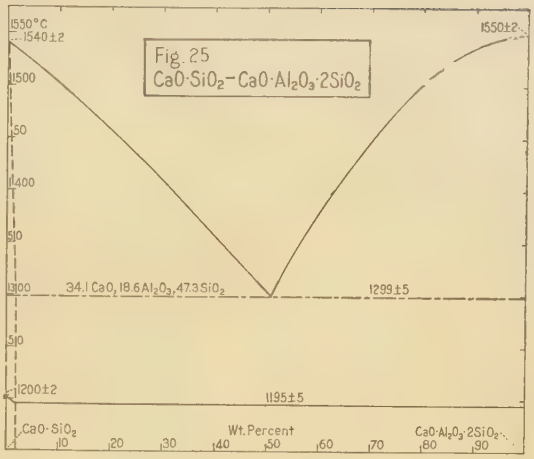


Fig. 25
CaO·SiO2–CaO·Al2O3·2SiO2
1550±2
1540±2
34.1 CaO, 18.6 Al2O3, 47.3 SiO2
1299±5
1200±2
1195±5
CaO·SiO2
Wt. Percent
CaO·Al2O3·2SiO2

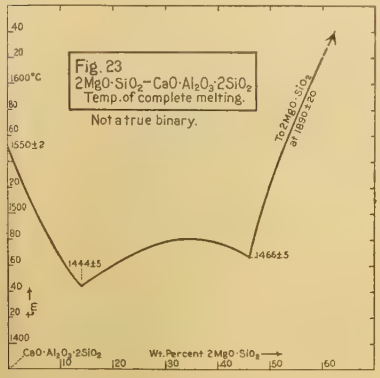


Fig. 23
2MgO·SiO2–CaO·Al2O3·2SiO2
Temp. of complete melting.
Not a true binary.
To 2MgO·SiO2 at 1895±20
1444±5
1466±5
CaO·Al2O3·2SiO2
Wt. Percent 2MgO·SiO2

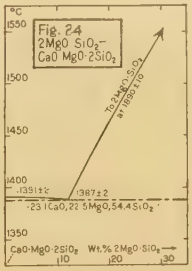


Fig. 24
2MgO·SiO2–
CaO·MgO·2SiO2
To 2MgO·SiO2 at 1890±10
1391±2
1387±2
23.1 CaO, 22.5 MgO, 54.4 SiO2
CaO·MgO·2SiO2
Wt.% 2MgO·SiO2

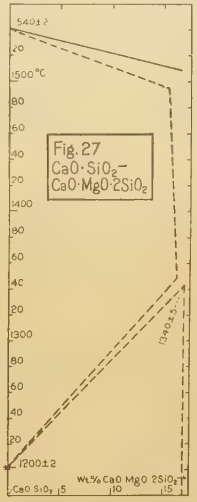


Fig. 27
CaO·SiO2–
CaO·MgO·2SiO2
1340±5
1200±2
CaO·SiO2
Wt.% CaO·MgO·2SiO2

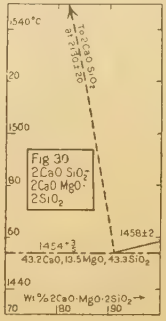


Fig 30
2CaO·SiO2–
2CaO·MgO·
2SiO2
To 2CaO·SiO2 at 1420±20
1458±2
1454±3
43.2 CaO, 13.5 MgO, 43.3 SiO2
Wt.% 2CaO·MgO·2SiO2

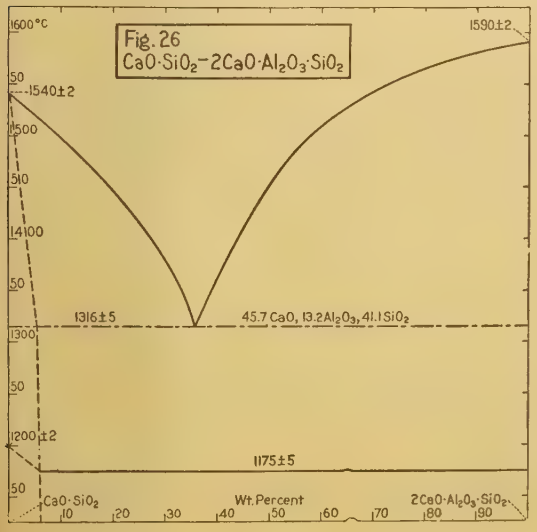


Fig. 26
CaO·SiO2–2CaO·Al2O3·SiO2
1590±2
1540±2
1316±5
45.7 CaO, 13.2 Al2O3, 41.1 SiO2
1200±2
1175±5
CaO·SiO2
Wt. Percent
2CaO·Al2O3·SiO2

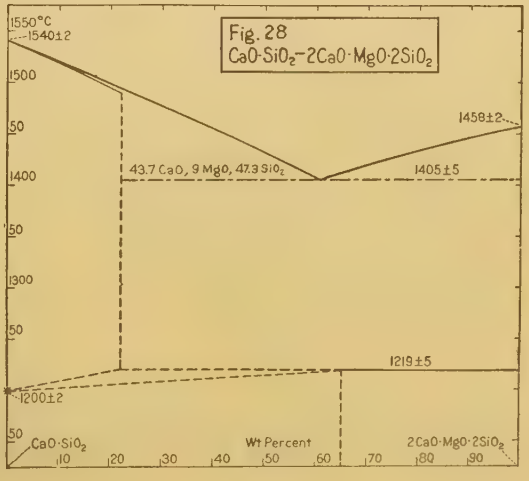


Fig. 28
CaO·SiO2–2CaO·MgO·2SiO2
1550°C
1540±2
1458±2
43.7 CaO, 9 MgO, 47.3 SiO2
1405±5
1219±5
1200±2
CaO·SiO2
Wt. Percent
2CaO·MgO·2SiO2

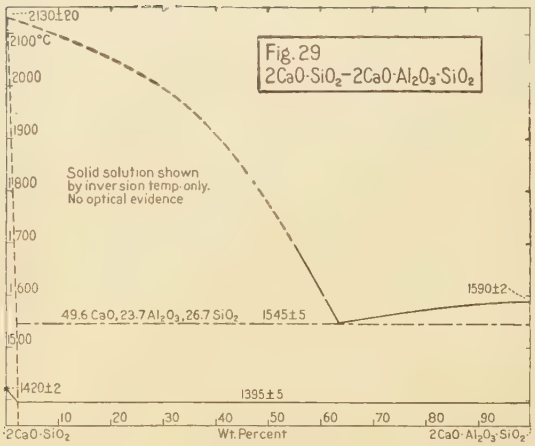


Fig. 29
2CaO·SiO2–2CaO·Al2O3·SiO2
Solid solution shown by inversion temp. only. No optical evidence
2130±20
2100°C
1590±2
49.6 CaO, 23.7 Al2O3, 26.7 SiO2
1545±5
1420±2
1395±5
2CaO·SiO2
Wt. Percent
2CaO·Al2O3·SiO2

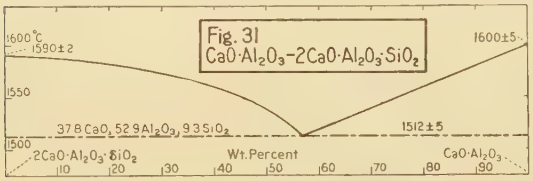


Fig. 31
CaO·Al2O3–2CaO·Al2O3·SiO2
1600°C
1590±2
1600±5
37.8 CaO, 52.9 Al2O3, 9.3 SiO2
1512±5
2CaO·Al2O3·SiO2
Wt. Percent
CaO·Al2O3

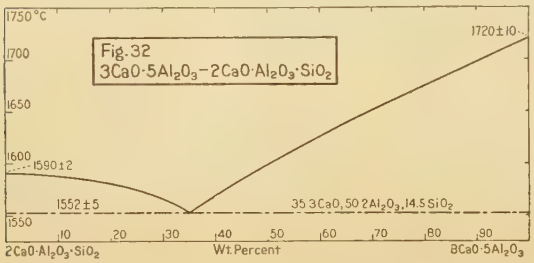


Fig. 32
3CaO·5Al2O3–2CaO·Al2O3·SiO2
1750°C
1720±10
1590±2
1552±5
35.3 CaO, 50.2 Al2O3, 14.5 SiO2
2CaO·Al2O3·SiO2
Wt. Percent
8CaO·5Al2O3

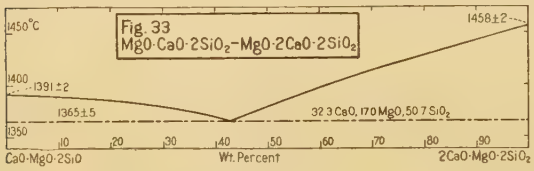


Fig. 33
MgO·CaO·2SiO2–MgO·2CaO·2SiO2
1450°C
1458±2
1391±2
1365±5
32.3 CaO, 17.0 MgO, 50.7 SiO2
CaO·MgO·2SiO
Wt. Percent
2CaO·MgO·2SiO2

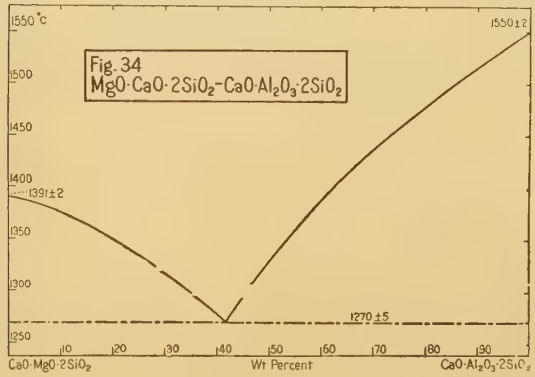


Fig. 34
MgO·CaO·2SiO2–CaO·Al2O3·2SiO2
1550°C
1550±2
1391±2
1270±5
CaO·MgO·2SiO2
Wt Percent
CaO·Al2O3·2SiO2

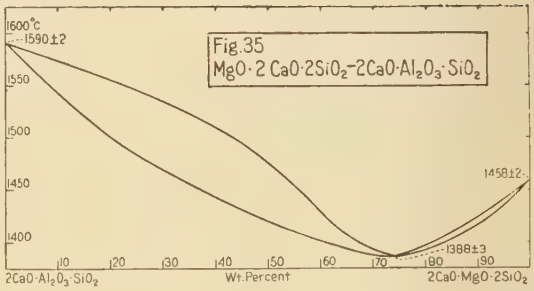


Fig. 35
MgO·2CaO·2SiO2–2CaO·Al2O3·SiO2
1600°C
1590±2
1458±2
1388±3
2CaO·Al2O3·SiO2
Wt. Percent
2CaO·MgO·2SiO2

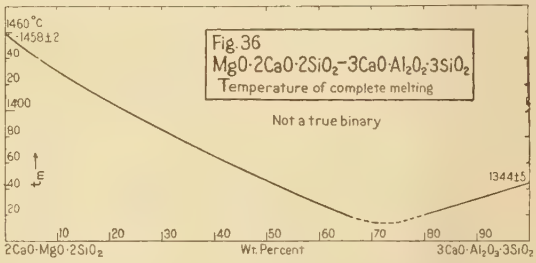


Fig. 36
MgO·2CaO·2SiO2–3CaO·Al2O3·3SiO2
Temperature of complete melting
Not a true binary
1460°C
1458±2
1344±5
E
2CaO·MgO·2SiO2
Wt. Percent
3CaO·Al2O3·3SiO2

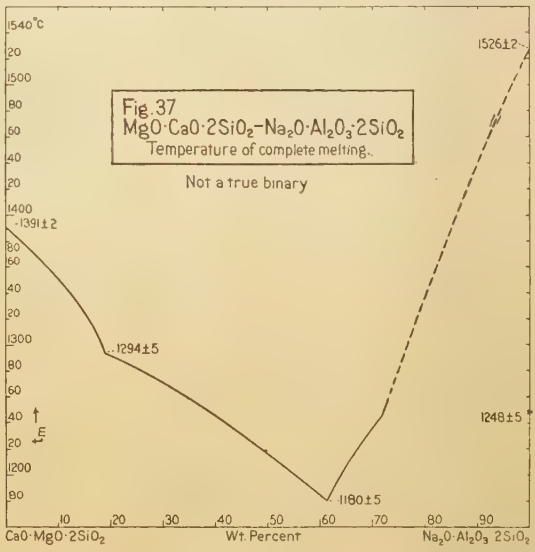


Fig. 37
MgO·CaO·2SiO2–Na2O·Al2O3·2SiO2
Temperature of complete melting.
Not a true binary
1540°C
1526±2
1391±2
1294±5
1248±5
1180±5
E
CaO·MgO·2SiO2
Wt. Percent
Na2O·Al2O3·2SiO2

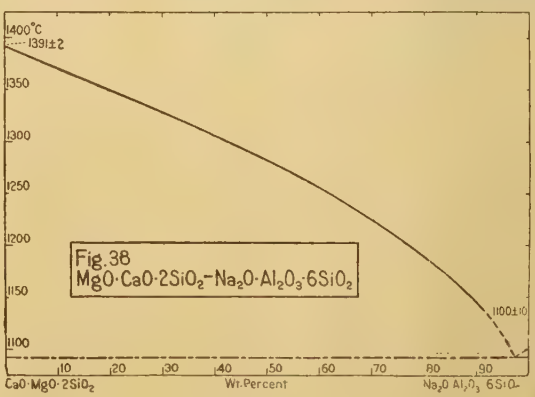


Fig. 38
MgO·CaO·2SiO2–Na2O·Al2O3·6SiO2
1400°C
1391±2
1100±10
CaO·MgO·2SiO2
Wt. Percent
Na2O·Al2O3·6SiO2

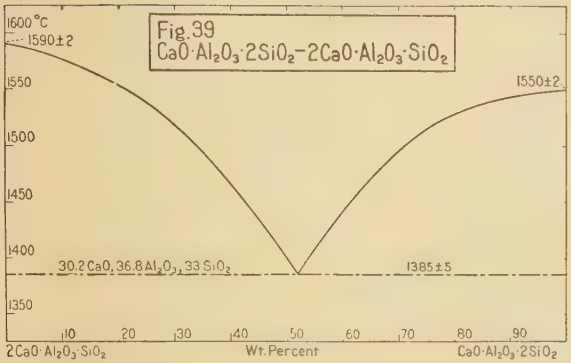
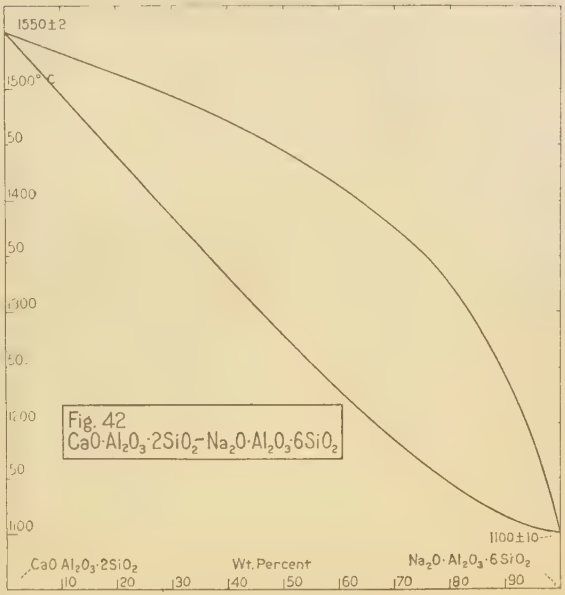
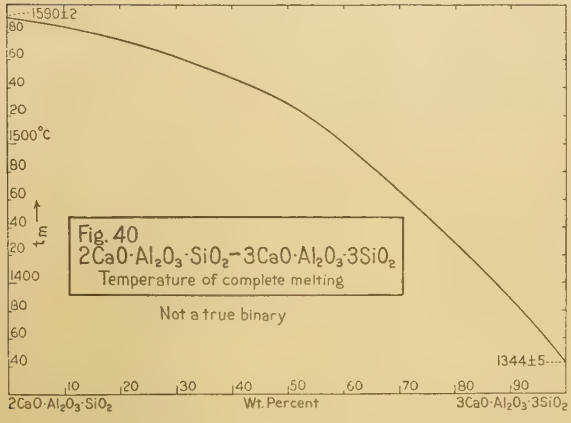
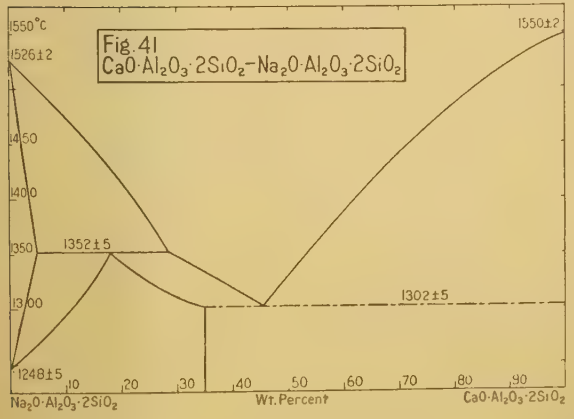
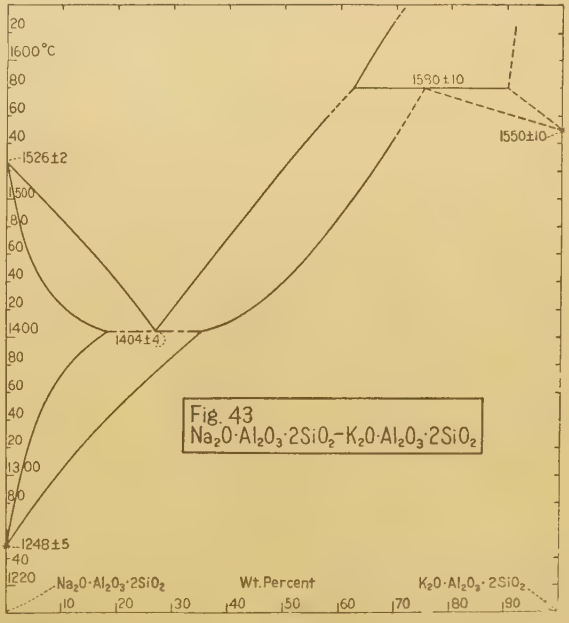


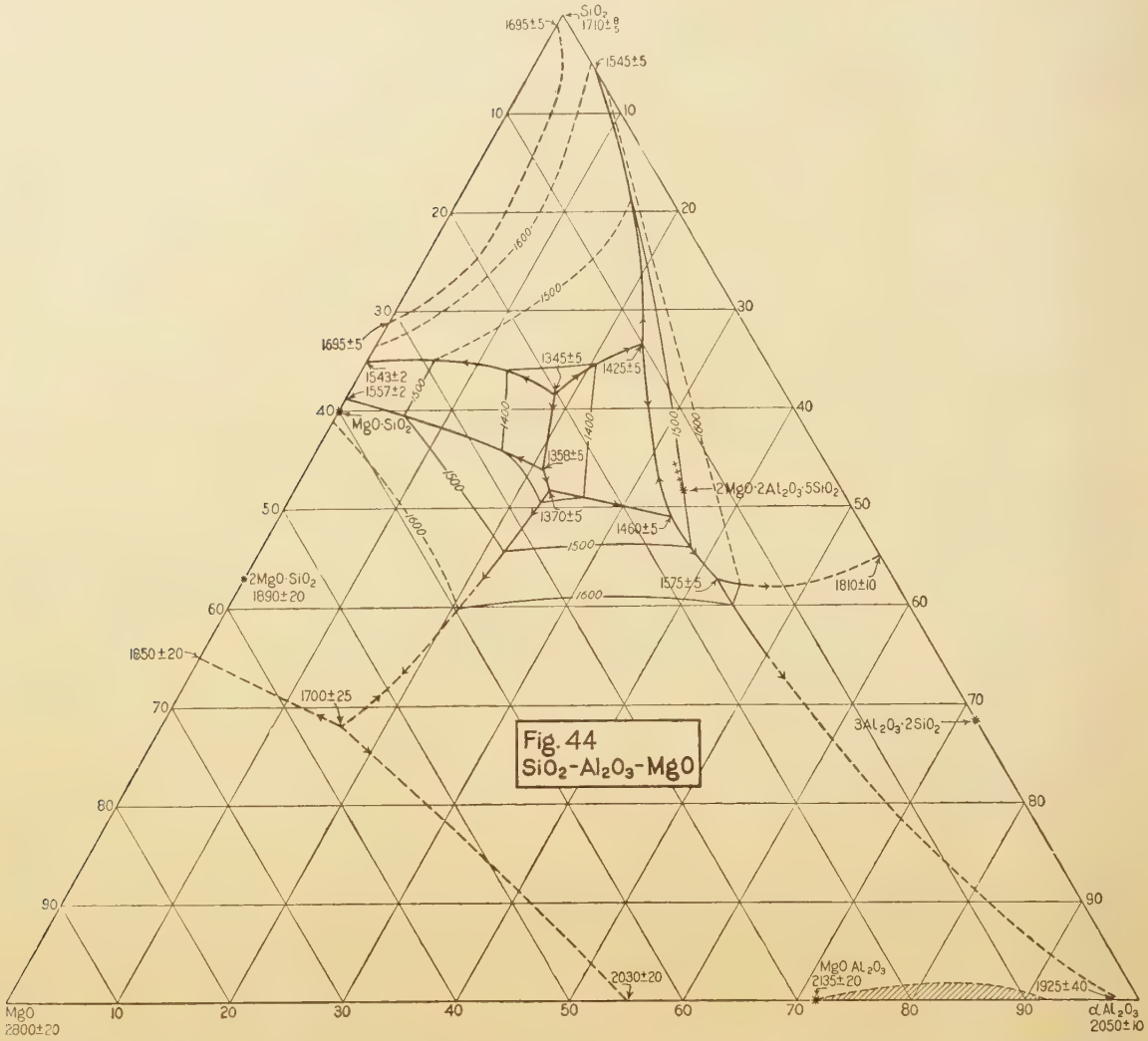
Fig. 39
$CaO \cdot Al_2O_3 \cdot 2SiO_2 - 2CaO \cdot Al_2O_3 \cdot SiO_2$
1600°C
1590±2
1550
1500
1450
1400
1350
1550±2
30.2 CaO, 36.8 $Al_2O_3$, 33 $SiO_2$
1385±5
10 20 30 40 50 60 70 80 90
$2CaO \cdot Al_2O_3 \cdot SiO_2$
Wt. Percent
$CaO \cdot Al_2O_3 \cdot 2SiO_2$


1550±2
1500°C
50
1400
50
1300
50
1200
50
1100
1100±10
Fig. 42
$CaO \cdot Al_2O_3 \cdot 2SiO_2 - Na_2O \cdot Al_2O_3 \cdot 6SiO_2$
$CaO \cdot Al_2O_3 \cdot 2SiO_2$
Wt. Percent
$Na_2O \cdot Al_2O_3 \cdot 6SiO_2$
10 20 30 40 50 60 70 80 90


1590±2
1500°C
t°
Fig. 40
$2CaO \cdot Al_2O_3 \cdot SiO_2 - 3CaO \cdot Al_2O_3 \cdot 3SiO_2$
Temperature of complete melting
Not a true binary
1344±5
10 20 30 40 50 60 70 80 90
$2CaO \cdot Al_2O_3 \cdot SiO_2$
Wt. Percent
$3CaO \cdot Al_2O_3 \cdot 3SiO_2$


1550°C
1526±2
1550±2
Fig. 41
$CaO \cdot Al_2O_3 \cdot 2SiO_2 - Na_2O \cdot Al_2O_3 \cdot 2SiO_2$
1450
1400
1350
1352±5
1300
1302±5
1248±5
10 20 30 40 50 60 70 80 90
$Na_2O \cdot Al_2O_3 \cdot 2SiO_2$
Wt. Percent
$CaO \cdot Al_2O_3 \cdot 2SiO_2$


1600°C
1590±10
1550±10
1526±2
1500
1404±4
1400
1300
1248±5
1220
Fig. 43
$Na_2O \cdot Al_2O_3 \cdot 2SiO_2 - K_2O \cdot Al_2O_3 \cdot 2SiO_2$
$Na_2O \cdot Al_2O_3 \cdot 2SiO_2$
Wt. Percent
$K_2O \cdot Al_2O_3 \cdot 2SiO_2$
10 20 30 40 50 60 70 80 90




ONE BINARY + ONE TERNARY COMPOUND.—(*Continued*)

| Binary | Ternary | Lit. |
|---|---|---|
| $2CaO.SiO_2$ | $2CaO.Al_2O_3.SiO_2$ | (113); *v.* Fig. 29 |
| | $2CaO.MgO.2SiO_2$ | (50); *v.* Fig. 30 |
| $CaO.Al_2O_3$ | $2CaO.Al_2O_3.SiO_2$ | (113); *v.* Fig. 31 |
| $3CaO.5Al_2O_3$ | $2CaO.Al_2O_3.SiO_2$ | (113); *v.* Fig. 32 |
| $Na_2O.2SiO_2$ | $Na_2O.2CaO.3SiO_2$ | (100) |

TWO TERNARY COMPOUNDS

| A | B | Lit. and remarks |
|---|---|---|
| $MgO.CaO.2SiO_2$ | $MgO.2CaO.2SiO_2$ | (50); *v.* Fig. 33 |
| | $CaO.Al_2O_3.2SiO_2$ | (13); *v.* Fig. 34 |
| $MgO.2CaO.2SiO_2$ | $2CaO.Al_2O_3.SiO_2$ | (48); *v.* Fig. 35 |
| | $3CaO.Al_2O_3.3SiO_2$ | (24); *v.* Fig. 36 |
| | $[10(3Na_2O.Al_2O_3.3SiO_2)$ | Not a true binary |
| | $90(3CaO.Al_2O_3.3SiO_2)]$ | (24) |
| $MgO.CaO.2SiO_2$ | $Na_2O.Al_2O_3.2SiO_2$ | (17); *v.* Fig. 37 |
| | $Na_2O.Al_2O_3.6SiO_2$ | (13); *v.* Fig. 38 |
| $CaO.Al_2O_3.2SiO_2$ | $2CaO.Al_2O_3.SiO_2$ | (113); *v.* Fig. 39 |
| $2CaO.Al_2O_3.SiO_2$ | $3CaO.Al_2O_3.3SiO_2$ | (24); *v.* Fig. 40 |

| A | B | Lit. and remarks |
|---|---|---|
| $CaO.Al_2O_3.2SiO_2$ | $SrO.Al_2O_3.2SiO_2$ | Probably complete solid solution (42) |
| | $Na_2O.Al_2O_3.2SiO_2$ | (9); *v.* Fig. 41 |
| | $Na_2O.Al_2O_3.6SiO_2$ | (10, 11); *v.* Fig. 42 |
| $2CaO.Al_2O_3.SiO_2$ | $10(3Na_2O.Al_2O_3.3SiO_2)$ | Not a true binary (24) |
| | $90(3CaO.Al_2O_3.3SiO_2)$ | |
| $Na_2O.Al_2O_3.2SiO_2$ | $K_2O.Al_2O_3.2SiO_2$ | (14); *v.* Fig. 43 |

THREE-COMPONENT SYSTEMS

| | |
|---|---|
| $SiO_2$-O-Fe (151) | $SiO_2$-$Al_2O_3$-BaO (147) |
| $SiO_2$-$TiO_2$-MnO (25) | $SiO_2$-$Al_2O_3$-$Li_2O$ (5) |
| $SiO_2$-$TiO_2$-CaO (133) | $SiO_2$-$Al_2O_3$-$Na_2O$ (114) |
| $SiO_2$-$ZrO_2$-$Li_2O$ (126) | $SiO_2$-$Al_2O_3$-$K_2O$ (114) |
| $SiO_2$-MnO-FeO (84) | $SiO_2$-CaO-$Li_2O$ (126) |
| $SiO_2$-MnO-$Al_2O_3$ (25) | $TiO_2$-MnO-$Al_2O_3$ (25) |
| $SiO_2$-FeO-MgO* (61) | $Fe_2O_3$-$Al_2O_3$-CaO (26) |
| $SiO_2$-FeO-CaO (91) | |

* Immiscibility extends across ternary system. $L_1$ = 20MgO, 15FeO, 65$SiO_2$, Wt. %.

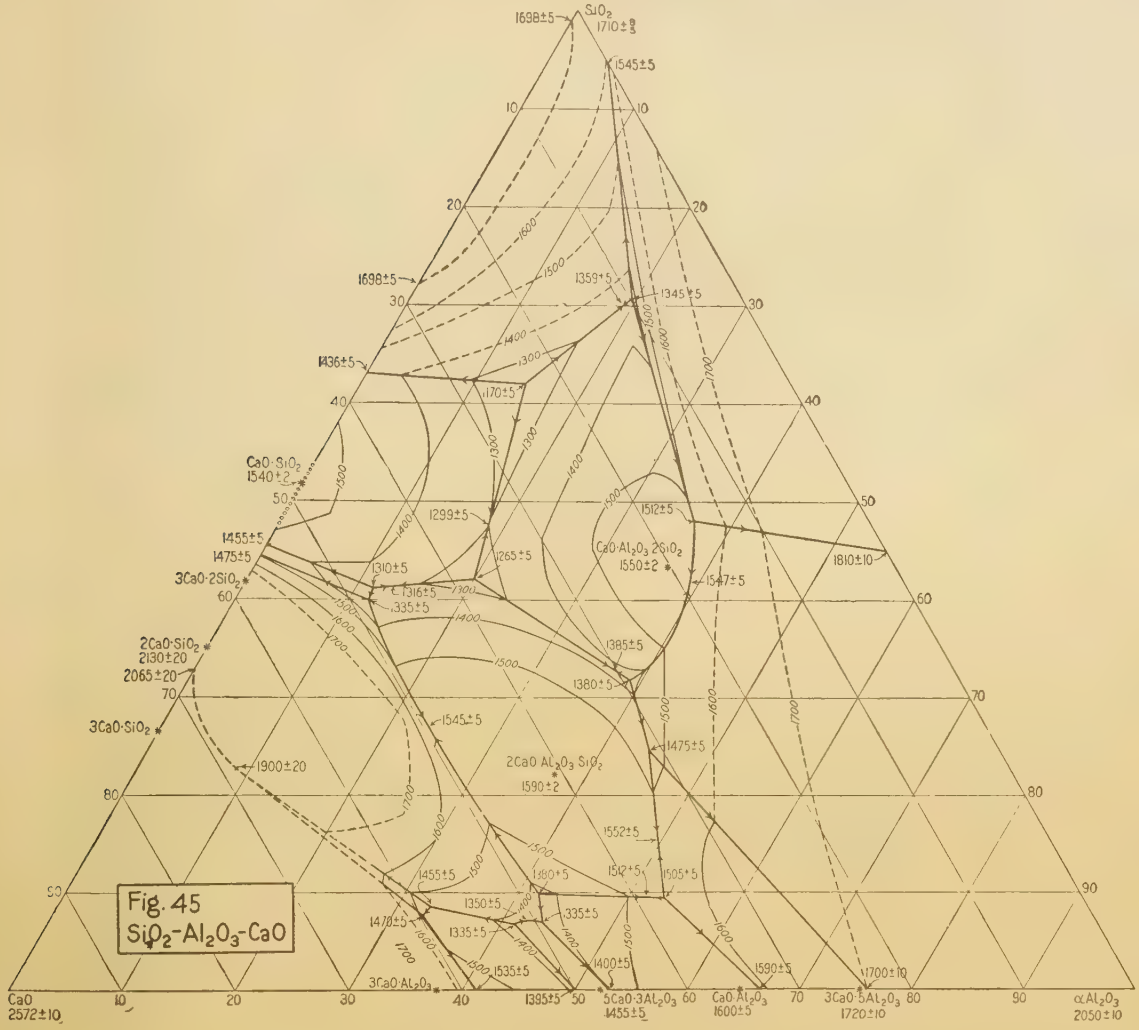



FIG. 45.—Composition of Mullite, $3Al_2O_3.2SiO_2$ not shown. *See* Fig. 44.

**THREE-COMPONENT SYSTEMS.**—*(Continued)*

$2CaO.Al_2O_3.SiO_2$-$3CaO.Al_2O_3.3SiO_2$-$2CaO.MgO.2SiO_2$ (24); *v.* Fig. 50

For other systems, *v.* (24); Figs. 52, 53.

$SiO_2$-$Al_2O_3$-MgO (20, 61, 112); *v.* FIG. 44

Ternary compound

$2MgO.2Al_2O_3.5SiO_2$ forms solid solutions and melts incongruently.

Eutectics and quadruple points

| *t*, °C | Solid phases | Point \ Wt. % | A, $SiO_2$ | B, $Al_2O_3$ | C, MgO |
|---|---|---|---|---|---|
| 1345 ± 5 | $A_6B_2C_2$(mix.) + AC + A | E | 61.4 | 18.3 | 20.3 |
| 1700 ± 25 | $AC_2$ + BC + C | E | 28 | 16 | 56 |
| 1358 ± 5 | $A_4B_2C_2$ + AC + $AC_2$ | E | 54 | 21 | 25 |
| 1425 ± 5 | $A_4B_2C_2$ + $A_2B_3$ + A | Q | 66.5 | 23.5 | 10 |
| 1460 ± 5 | $A_6B_2C_2$ + BC + $A_2B_3$ | Q | 49.1 | 34.8 | 16.1 |
| 1370 ± 5 | $A_4B_2C_2$ + BC + $AC_2$ | Q | 51.5 | 22.8 | 25.7 |
| 1575 ± 5 | $A_2B_3$ + BC + B | Q | 42.8 | 42 | 15.2 |

Points on field boundaries, Wt. %

| Field 1 | Field 2 | A, $SiO_2$ | B, $Al_2O_3$ | C, MgO |
|---|---|---|---|---|
| $3Al_2O_3.2SiO_2$ | $SiO_2$ | 77 | 18 | 5 |
| | $2MgO.2Al_2O_3.5SiO_2$ | 86 | 12 | 2 |
| | $Al_2O_3.MgO$ | 57 | 29 | 14 |
| $2MgO.SiO_2$ | $MgO.Al_2O_3$ | 45 | 39 | 16 |
| $2MgO.2Al_2O_3.5SiO_2$ | $SiO_2$ | 42 | 21 | 37 |
| $MgO.SiO_2$ | $SiO_2$ | 64 | 20 | 16 |
| | $2MgO.SiO_2$ | 64 | 12 | 24 |
| $Al_2O_3$ | $MgO.Al_2O_3$ | 65 | 5 | 30 |
| $3Al_2O_3.2SiO_2$ | $2MgO.2Al_2O_3.5SiO_2$ | 58.2 | 10 | 31.8 |
| $2MgO.2Al_2O_3.5SiO_2$ | $MgO.SiO_2$ | 24 | 63 | 13 |

Max. temps. occur but not well defined.

Immiscibility curves

| | | A, $SiO_2$ | B, $Al_2O_3$ | C, MgO |
|---|---|---|---|---|
| $L_1$ | $L_2$ | 85.0 | 4.5 | 10.5 |
| | | 75.0 | 4.5 | 20.5 |

The silica liquidus is discontinuous (61); *see* the one- and two-component systems; for solid solution, *v.* (112).

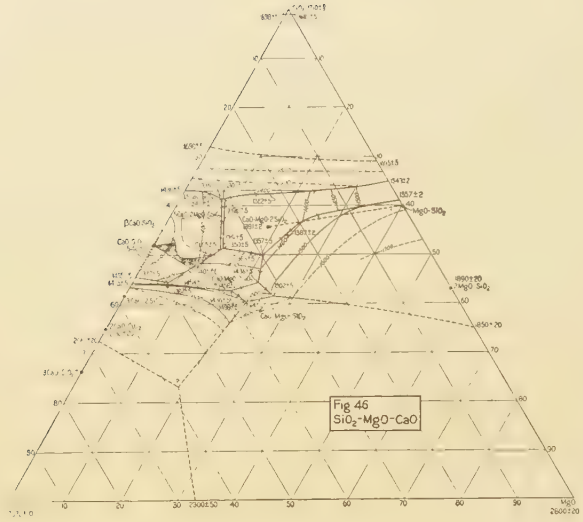
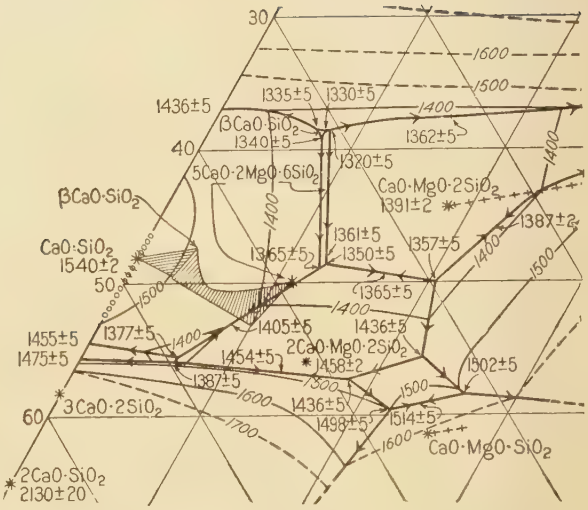
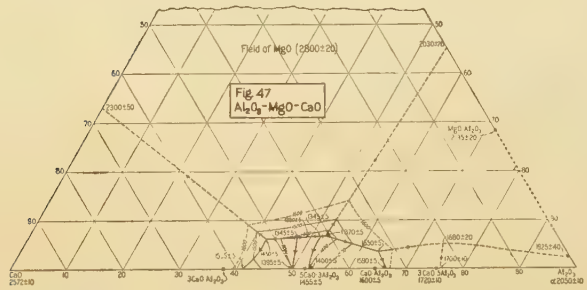
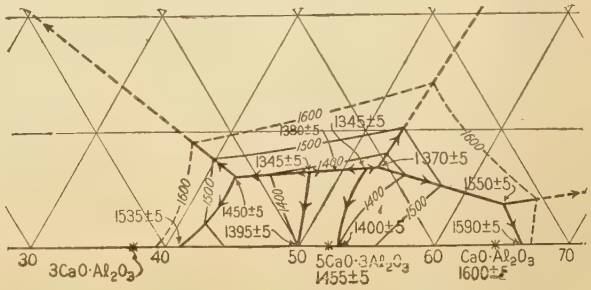


Fig 46
SiO2-MgO-CaO


1436±5
1335±5
1330±5
βCaO·SiO2
1340±5
1362±5
5CaO·2MgO·6SiO2
1320±5
CaO·MgO·2SiO2
1391±2
βCaO·SiO2
1387±2
CaO·SiO2
1540±2
1361±5
1365±5
1350±5
1357±5
1365±5
1405±5
1436±5
1455±5
1475±5
1377±5
2CaO·MgO·2SiO2
1454±5
1458±2
1387±5
1502±5
3CaO·2SiO2
1436±5
1498±5
1514±5
CaO·MgO·SiO2
2CaO·SiO2
2130±20


Field of MgO (2800±20)
Fig. 47
Al2O3-MgO-CaO


1345±5
1380±5
1345±5
1370±5
1550±5
1535±5
1450±5
1395±5
1400±5
1590±5
3CaO·Al2O3
5CaO·3Al2O3
1455±5
CaO·Al2O3
1600±5

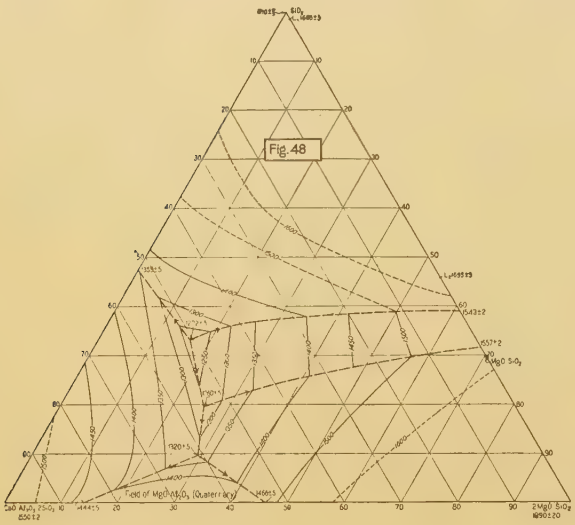


Fig. 48
Field of MgO·Al2O3 (Quaternary)

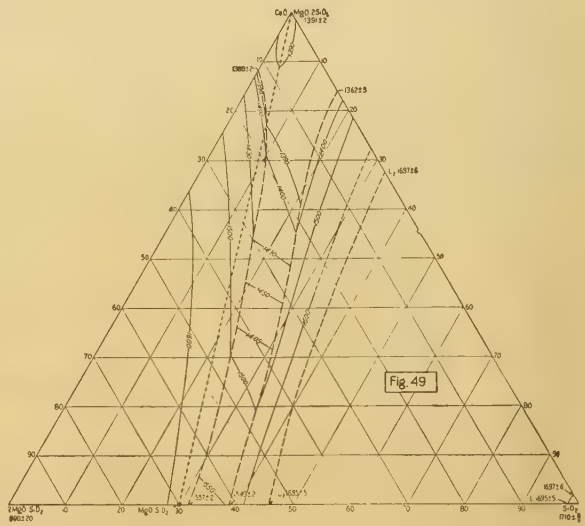
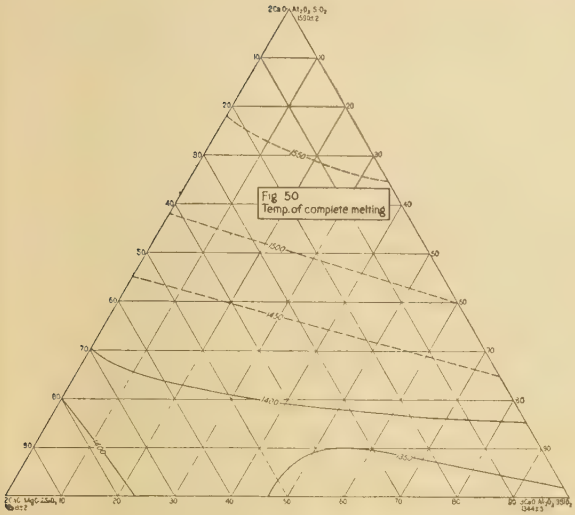
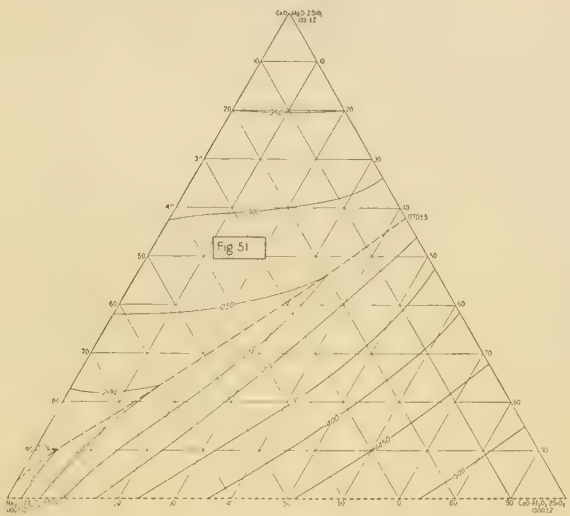
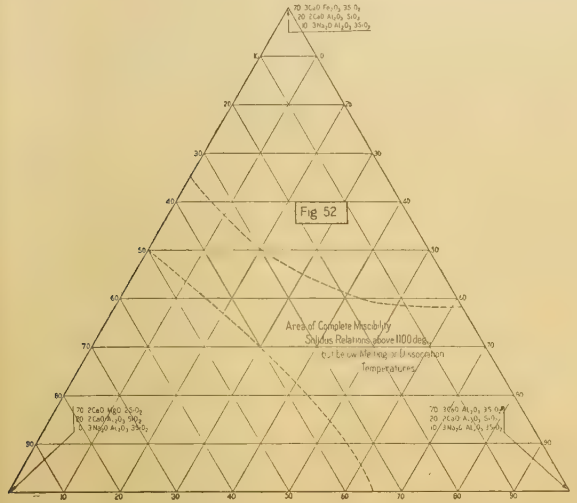
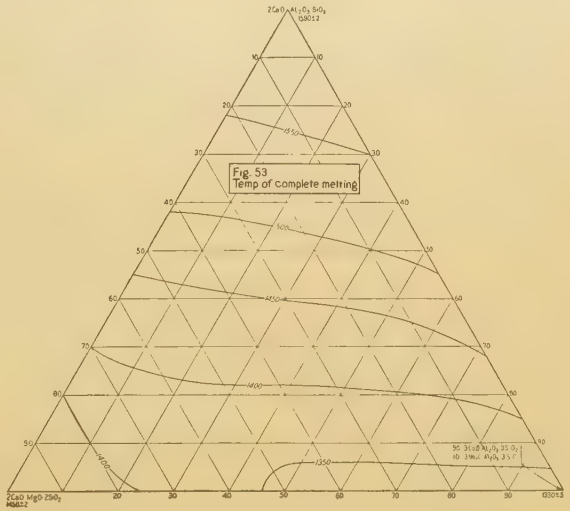


Fig. 49




## $SiO_2$-$Al_2O_3$-CaO (18, 20, 61, 75, 76, 77, 113, 129); *v.* Fig. 45

### Ternary compounds

$CaO.Al_2O_3.2SiO_2$: m, 1550 ± 2; $2CaO.Al_2O_3.SiO_2$: m, 1590 ± 2; $3CaO.Al_2O_3.SiO_2$: d, 1335 ± 5 into $\beta 2CaO.SiO_2 + CaO.Al_2O_3$; *see* one-component system.

### Eutectics and quadruple points

| *t*, °C | Solid phases | W. % Point | A, $SiO_2$ | B, $Al_2O_3$ | C, CaO |
|---|---|---|---|---|---|
| 1170 ± 5 | $A_2BC + A + AC$ | E | 62.0 | 14.7 | 23.3 |
| 1345 ± 5 | $A_2BC + A + AB_2$ | E | 70.4 | 19.8 | 9.8 |
| 1265 ± 5 | $A_2BC + ABC_2 + \alpha AC$ | E | 42 | 20 | 38 |
| 1310 ± 5 | $ABC_2 + A_2C_3 + \alpha AC$ | E | 41 | 11.8 | 47.2 |
| 1505 ± 5 | $ABC_2 + BC + B_3C_2$ | E | 9.25 | 53.25 | 37.5 |
| 1380 ± 5 | $A_2BC + AEC_2 + \alpha B$ | E | 31.8 | 39 | 29.2 |
| 1335 ± 5 | $\beta AC_2 + BC + B_3C_5$ | E | 6.8 | 43.7 | 49.5 |
| 1335 ± 5 | $\beta AC_2 + BC_3 + B_3C_5$ | E | 6.8 | 41.2 | 52 |
| 1512 ± 5 | $A_2BC + \alpha B + A_2B_3$ | Q | 47.9 | 36.5 | 15.6 |
| 1380 ± 5 | $ABC_2 + \beta AC_2 + BC$ | Q | 9.7 | 42 | 48.3 |
| 1475 ± 5 | $ABC_2 + B_3C_2 + \alpha B$ | Q | 24.3 | 44.5 | 31.2 |
| 1335 ± 5 | $ABC_2 + A_2C_3 + \beta AC_2$ | Q | 39.9 | 11.9 | 48.2 |
| 1455 ± 5 | $AC_2 + BC_3 + \alpha AC_2$ | Q | 8.7 | 33 | 58.3 |
| 1470 ± 5 | $C + AC_2 + BC_3$ | Q | 7.5 | 32.8 | 59.7 |
| 1900 ± 20 | $C + \alpha AC_2 + AC_2$ | Q | 22.4 | 9.2 | 68.4 |

### Points on field boundaries, Wt. %

| Field 1 | Field 2 | A, $SiO_2$ | B, $Al_2O_3$ | C, CaO |
|---|---|---|---|---|
| $CaO.Al_2O_3.2SiO_2$ ..... | $3Al_2O_3.2SiO_2$ ..... | 39 | 40 | 21 |
| | | 34.7 | 40.3 | 25 |
| $\beta 2CaO.SiO_2$ ..... | $5CaO.3Al_2O_3$ ..... | 7 | 42 | 51 |
| $2CaO.SiO_2$ ..... | $2CaO.Al_2O_3.SiO_2$ ... | 16.8 | 34 | 49.2 |
| | | 33 | 17.5 | 49.5 |
| Immiscibility (61) $L_1$ = ..... | | 85 | 2.5 | 12.5 |

The silica liquidus is discontinuous (18, 61); *see* the two-component systems

## $SiO_2$-MgO-CaO (12, 50, 51, 61); *v.* Fig. 46

### Ternary compounds

$CaO.MgO.2SiO_2$: m, 1391 ± 2; $2CaO.MgO.2SiO_2$: m, 1458 ± 2; $CaO.MgO.SiO_2$: solid solution extends to CaO, 33; MgO, 28; $SiO_2$, 39; pure compound not stable in presence of melt; $5CaO.2MgO.6SiO_2$(?): d, 1365 ± 5 into $\alpha CaO.SiO_2$ + liquid.

### $SiO_2$-MgO-CaO.—(*Continued*)

Eutectics and quadruple points

| *t*, °C | Solid phases | Wt. % / Point | A, $SiO_2$ | B, MgO | C, CaO |
|---|---|---|---|---|---|
| 1320 ± 5 | $A_2BC + A_6B_2C_5 + A$ | E | 61.4 | 8 | 30.6 |
| 1350 ± 5 | $A_6B_2C_5 + A_2BC + A_2BC_2$ | E | 51.4 | 12.6 | 36 |
| 1357 ± 5 | $A_2BC_2 + A_2BC + AB_2$ | E | 50 | 20.2 | 29.8 |
| 1377 ± 5 | $A_2BC_2 + AC + A_2C_3$ | E | 44.5 | 6.3 | 49.2 |
| 1436 ± 5 | $A_2BC_2 + ABC(mix.) + AC_2$ | E | 42.7 | 18.3 | 39 |
| ? | $AC_2 + B + C$ | E | ? | ? | ? |
| 1330 ± 5 | $\beta AC(mix.) + A_6B_2C_5(mix.) + A$ | Q | 61.4 | 7.6 | 30.9 |
| 1335 ± 5 | $\alpha AC(mix.) + \beta AC(mix.) + A$ | Q | 61.5 | 7.2 | 31.3 |
| 1340 ± 5 | $\alpha AC(mix.) + \beta AC(mix) + A_6B_2C_5(mix.)$ | Q | 61 | 7.6 | 31.4 |
| 1365 ± 5 | $\alpha AC(mix.) + A_6B_2C_5 + A_2BC_2$ | Q | 51 | 12.3 | 36.7 |
| 1387 ± 5 | $\beta AC_2 + A_2C_3 + A_2BC_2$ | Q | 44.3 | 6.2 | 49.5 |
| 1436 ± 5 | $A_2BC_2 + ABC(mix.) + AB_2$ | Q | 44.4 | 22.3 | 33.3 |
| 1498 ± 5 | $ABC(mix.) + \alpha AC_2 + B$ | Q | 40.4 | 22.3 | 37.3 |
| 1502 ± 5 | $ABC(mix.) + AB_2 + B$ | Q | 41.5 | 26.4 | 32.1 |

Points on field boundaries, Wt. %

| Field 1 | Field 2 | A, $SiO_2$ | B, MgO | C, CaO |
|---|---|---|---|---|
| $SiO_2$ | $CaO.SiO_2$ | 63 | 3 | 34 |
| $CaO.MgO.2SiO_2$ | $SiO_2$ | 62.4 | 15.6 | 22 |
| | | 62 | 10 | 28 |
| $CaO.MgO.2SiO_2$(mix.) | $2MgO.SiO_2$ | 54.3 | 22.7 | 23.0 |
| | | 57 | 24 | 19 |
| | | 59 | 30 | 11 |
| Immiscibility [61] $L_1$ = | | 70 | 17 | 13 |

The extensive solid solutions found in this system cannot properly be given here; *see* [12, 50, 51] for details; refer to the one-component and two-component systems involved, and also the ternary system, $CaO.MgO.2SiO_2$-$2MgO.SiO_2$-$SiO_2$. The silica liquidus is discontinuous [18, 61].

### $SiO_2$-CaO-$Na_2O$ [100]; *see also* Vol. II, p. 97

Ternary eutectics and quadruple points

| *t*, °C | Solid phases | Wt. % / Point | A, $SiO_2$ | B, CaO | C, $Na_2O$ |
|---|---|---|---|---|---|
| 725 ± 5 | $A_2C + A_6B_3C$ + quartz | E | 73.5 | 5.2 | 21.3 |
| 821 ± 5 | $AC + A_2C + A_2BC_2$ | E | 60.7 | 1.8 | 37.5 |
| 827 ± 5 | $A_2C + A_3BC_2 + A_2B_2C$ | Q | 61.4 | 2.0 | 36.6 |
| 740 ± 5 | $A_2C + A_3B_2C + A_6B_3C$ | Q | 70.7 | 5.2 | 24.1 |
| 1030 ± 10 | $A_3B_2C + A_6B_3C + \beta AB$ | Q | 66.5 | 14.5 | 19 |
| *ca.* 1030 | $A_6B_3C + \beta AB$ + tridymite | Q | 73 | 13 | 14 |
| *ca.* 1118 | $\alpha AB + \beta AB$ + tridymite | Q | 73 | 15.5 | 11.5 |
| *ca.* 1118 | $\alpha AB + \beta AB + A_3B_2C$ | Q | 63 | 19 | 18 |

The region of immiscibility probably extends slightly from the CaO-$SiO_2$ binary system into the ternary system. The $\alpha$-$\beta$ inversion of $CaO.SiO_2$ takes place in the pure materials at 1200°. The lowered inversion (1118) must indicate solid solutions but these have not been investigated.

### $Al_2O_3$-MgO-CaO [111]; *v.* Fig. 47

Eutectics and quadruple points

| *t*, °C | Solid phases | Wt. % / Point | A, $Al_2O_3$ | B, MgO | C, CaO |
|---|---|---|---|---|---|
| 1345 ± 5 | $AC + B + A_3C_5$ | E | 51.8 | 6.7 | 41.5 |
| 1345 ± 5 | $A_3C_5 + AC_3 + B$ | E | 47.7 | 6.3 | 46 |
| 1680 ± 20 | $\alpha A + AB(mix.) + A_5C_8$ | Q | 74 | 5 | 21 |
| 1550 ± 5 | $A_5C_8 + AB(mix.) + AC$ | Q | 63.2 | 3.5 | 33.3 |
| 1370 ± 5 | $AC + B + AB(mix.)$ | Q | 52.4 | 6.9 | 40.7 |
| 1450 ± 5 | $C + B + AC_3$ | Q | 42.5 | 6.0 | 51.5 |

Points on the field boundaries, Wt. %

| Field 1 | Field 2 | A, $Al_2O_3$ | B, MgO | C, CaO |
|---|---|---|---|---|
| CaO | $3CaO.Al_2O_3$ | 42 | 2 | 56 |
| $5CaO.3Al_2O_3$ | $CaO.Al_2O_3$ | 51.8 | 3.2 | 45 |

Owing to the chance formation of $\alpha$ or $\beta Al_2O_3$ the limits of the field of $Al_2O_3$ are not entirely definite; *see also* the one- and two-component systems involved.

### $SiO_2$-$2MgO.SiO_2$-$CaO.Al_2O_3.2SiO_2$ [4]; *v.* Fig. 48

A = $SiO_2$; B = $2MgO.SiO_2$; C = $CaO.Al_2O_3.2SiO_2$.

Eutectics and quadruple points

| *t*, °C | Solid phases | Wt. % / Point | A | B | C |
|---|---|---|---|---|---|
| 1222 ± 5 | $CaO.Al_2O_3.2SiO_2 + MgO.SiO_2 + SiO_2$ | E | 33 | 16.5 | 50.5 |
| 1260 ± 5 | $CaO.Al_2O_3.2SiO_2 + MgO.SiO_2 + 2MgO.SiO_2$ | Q | 19.5 | 25.5 | 55 |
| 1320 ± 5 | $CaO.Al_2O_3.2SiO_2 + MgO.Al_2O_3 + 2MgO.SiO_2$ | Q* | 9.5 | 29.5 | 61 |

* This point is unlike the other two in that a phase ($MgO.Al_2O_3$) appears which cannot be considered as part of the ternary system. The boundaries of the $MgO.Al_2O_3$ field are not true crystallization lines like the other boundaries in the system, but indicate the primary phases and the temperatures of complete melting.

Points on field boundaries, Wt. %

| Field 1 | Field 2 | % A | % B | % C |
|---|---|---|---|---|
| $MgO.SiO_2$ | $SiO_2$ | 37 | 27 | 36 |
| | | 38 | 37 | 25 |
| $MgO.SiO_2$ | $2MgO.SiO_2$ | 29 | 54 | 17 |
| | | 23 | 33 | 44 |

The silica liquidus may be discontinuous [61].

### $SiO_2$-$2MgO.SiO_2$-$CaO.MgO.2SiO_2$ [12, 61]; *v.* Fig. 49

A = $SiO_2$; B = $2MgO.SiO_2$; C = $CaO.MgO.2SiO_2$.

This system is one in which a complete series of solid solutions of $CaO.MgO.2SiO_2$ and $MgO.SiO_2$ occur. Most of these solutions (pyroxenes) melt incongruently though the series has a stable minimum melting point. For details [12] should be consulted. *See also* one- and two-component systems involved. The silica liquidus may be discontinuous [18, 61].

Points on curved boundaries, Wt. %

| Boundary | % A | % B | % C | Boundary | % A | % B | % C |
|---|---|---|---|---|---|---|---|
| $2MgO.SiO_2$ | 79 | 15 | 6 | $SiO_2$ | 61 | 18 | 21 |
| ↓ | | | | ↓ | | | |
| Pyroxenes | 60 | 26 | 14 | Pyroxenes | 41 | 31 | 28 |
| | 30 | 46 | 24 | | 15 | 50 | 35 |

### $CaO.Al_2O_3.2SiO_2$-$CaO.MgO.2SiO_2$-$Na_2O.Al_2O_3.6SiO_2$ [13]; *v.* Fig. 51

A = $CaO.Al_2O_3.2SiO_2$; B = $CaO.MgO.2SiO_2$; C = $Na_2O.Al_2O_3.6SiO_2$.

Since in one binary system complete isomorphism occurs, the liquidus-solidus relations are complicated and the original should be consulted.

Points on boundary, Wt. %

| | | | |
|---|---|---|---|
| % A | 34 | 35 | 13 |
| % B | 46 | 25 | 20 |
| % C | 20 | 40 | 67 |

## LITERATURE

(For a key to the periodicals see end of volume)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# FREEZING-POINT—SOLUBILITY DATA FOR SYSTEMS CONTAINING ORGANIC COMPOUNDS ONLY

F. Spencer Mortimer*

Contents

Abbreviations and symbols.
Arrangement.
Two-component systems.
Three-component systems.
Temperature equations.
Cryoscopic data.

**Abbreviations and symbols.**—For most of these, *v.* p. 4. The following additional ones should be noted:

Trp. Triple point.
Crit. Temperature of complete miscibility of two liquid phases.
d When following a temperature datum indicates "decomposition."
m,s (*e.g.* in $A_m$, $B_s$, etc.) are used to distinguish metastable from stable forms.

* With acknowledgments to Dr. H. L. Ward for the critical evaluation of the data for certain binary systems and to Mr. Ned Guthrie for typing and proof-reading.

Matières

Abréviations et symboles.
Arrangement.
Systèmes à deux constituants.
Systèmes à trois constituants.
Équations de température.
Données cryoscopiques.

**Abréviations et symboles.**—Pour la plupart de ceux-ci, *v.* p. 4. On notera en plus les suivants:

Trp. Point triple.
Crit. Température de miscibilité complète de deux phases liquides.
d Lorsqu'il suit une température, indique "décomposition."
m,s (par. ex. dans $A_m$, $B_s$, etc.) sont utilisés pour distinguer la forme métastable de la forme stable.

* Avec remerciements à Dr. H. L. Ward pour l'évaluation critique des données pour certains systèmes binaires et à Mr. Ned Guthrie pour la copie et la lecture des épreuves.

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Abkürzungen und Zeichen.
Anordnung.
Zweikomponenten-Systeme.
Dreikomponenten-Systeme.
Temperatur Gleichungen.
Kryoskopische Daten.

**Abkürzungen und Zeichen.**—Der grösste Teil davon ist S. 4 zu finden. Ergänzend werden noch angeführt:

Trp. Tripl-Punkt.
Crit. Temperatur vollständiger Mischbarkeit zweier flüssiger Phasen.
d Einer Temperaturangabe folgend, bedeutet dies "Zersetzung."
m,s (*e.g.* in $A_m$, $B_s$, u.s.w.) werden zur Unterscheidung der metastabilen Formen von den stabilen verwendet.

* Herrn H. L. Ward für die kritische Verwertung von Daten einiger bestimmter binärer Systeme und Herrn Ned Guthrie für die Niederschrift und Korrektur ist schuldiger Dank auszusprechen.

Indice

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**Abbreviazioni e simboli.**—Per la maggior parte di essi, *vedi* p. 4. Inoltre:

Trp. Punto triplo.
Crit. Temperatura di miscibilità completa delle due fasi liquide.
d Quando seque i dati di temperatura indica "scomposizione."
m,s (es. in $A_m$, $B_s$, ecc.) vengono usati per distinguere le forme stabili da quelle metastabili.

* I dati di alcuni sistemi binari sono stati vagliati dal Dott. H. L. Ward, e Mr. Ned Guthrie li ha scritto e corrette le bozze.

† Continuous series of mixed crystals with a minimum at the temperature and the composition given.

† Séries continues de cristaux mixtes avec un minimum à la température et pour la composition données.

† Vollständige Folge von Mischkristallen mit einem Minimum bei der angegebenen Temperatur und Zusammensetzung.

† Serie continua di cristalli misti con un minimo alla temperatura e alla composizione indicate.

**Arrangement.**—The ℭ-arrangement (*v.* Vol. III, p. viii) is followed throughout, and the systems are numbered serially. For convenience in locating all the systems in which a given component occurs, cross-references are given by means of the serial numbers. The reference expression "*v. also* p. ——" refers to the equations on p. 172.

**Arrangement.**—L'arrangement ℭ (*v.* Vol. III, p. viii) est utilisé partout, et les systèmes sont numérotés en série. Pour faciliter la détermination de la place de tous les systèmes dans lesquels se trouve un composé donné, les renvois sont donnés au moyen des numéros des séries. L'expression de référence "*v. also* p. ——" renvoie aux équations de la p. 172.

**Anordnung.**—Die ℭ-Anordnung (Bd. III, S. viii) ist durchwegs verwendet. Die Systeme sind nach Serien numeriert. Zur bequemen Auffindung all der Systeme in welcher eine gegebene Komponente sich vorfindet, werden Hinweise durch die Serienzahlen angeführt. Die Bezeichnung im Hinweise "*v. also* p. ——" bezieht sich auf die Seite 172 befindliche Gleichung.

**Disposizione.**—L'ordinamento adottato è sempre quello ℭ, e i sistemi sono numerati in serie (*vedi* Vol. III, p. viii). Per comodità, per indicare tutti i sistemi con un dato componente, il riferimento è fatto a mezzo dei numeri della serie. L'espressione "*v. also* p. ——" si riferisce all'equazione a p. 172.

# PART I

## TWO-COMPONENT SYSTEMS

### $CCl_4$

**1.** (207.5)
B = $CHCl_3$

| °C | Wt. % A |
|---|---|
| | A |
| −23.4 | 100 |
| −43.5 | 90 |
| −54.5 | 80 |
| −63.7 | 70 |
| −72.4 | 60 |
| −81.0 | 50 |
| | A + B |
| −81.4E | 49.4 |
| | B |
| −78.6 | 40 |
| −75.0 | 30 |
| −71.2 | 20 |
| −67.5 | 10 |
| −63.7 | 0 |

**4.** (477)
B = $C_4H_4O_4$
Fumaric acid

| °C | g B per 100 g A |
|---|---|
| 25.0 | 0.027 |

**5.** (477)
B = $C_4H_4O_4$
Maleic acid

| 25.0 | 0.002 |
|---|---|

**6.** (79)
B = $C_4H_8Cl_2S$
β, β-Dichlorodiethyl sulfide

| °C | Wt. % A |
|---|---|
| 13.9 | 0 |
| 10.5 | 10 |
| 7.2 | 20 |
| 3.8 | 30 |
| 0.5 | 40 |

**7.** *v.* p. 172
B = $C_6H_4Br_2$
*p*-Dibromobenzene

**7.1.** (17)
B = $C_6H_6$

| °C | Mol % A |
|---|---|
| | A |
| −24.2 | 100 |
| −30.0 | 95 |
| −35.4 | 90 |
| −44.8 | 80 |
| | A + AB |
| −47.0E | 72 |
| | AB |
| −40.8 | 70 |
| −35.3 | 60 |
| | AB + B |
| −34.0U | 52 |
| | B |
| −32.3 | 50 |
| −24.0 | 40 |
| −15.9 | 30 |
| − 8.5 | 20 |
| − 1.5 | 10 |
| + 5.5 | 0 |

**8.** (443)
B = $C_7H_5N_5O_8$
Trinitrophenylmethylnitroamine (Tetryl)

| °C | g B per 100 g A |
|---|---|
| 0 | 0.007 |
| 10 | 0.015 |
| 20 | 0.025 |
| 30 | 0.039 |
| 40 | 0.058 |
| 50 | 0.095 |
| 60 | 0.154 |
| 70 | 0.241 |

**9.** *v.* p. 172
B = $C_7H_6O_2$
Benzoic acid

**10.**
B = $C_8H_{10}N_4O_2$
Caffeine
*v.* Seidell, p. 186

**11.** *v.* p. 172
B = $C_{10}H_8$
Naphthalene

**11.1.** (71.1)
B = $C_{10}H_{14}O$
Thymol

| °C | g B per 100 g A |
|---|---|
| 0.0 | 32.0 |
| 25.0 | 96.3 |
| 38.5 | 376.0 |

**12.** *v.* p. 172
B = $C_{12}H_9N$
Carbazole

**13.** *v.* p. 172
B = $C_{12}H_{10}$
Acenaphthene

**14.** *v.* p. 172
B = $C_{13}H_{10}$
Fluorene

**15.** *v.* p. 172
B = $C_{14}H_{10}$
Anthracene

**16.** *v.* p. 172
B = $C_{14}H_{10}$
Phenanthrene

### $CO_2$

**17.** B = $CH_4O$
*See* Fig. 18, p. 213

**18.** (447.1)
B = $C_2H_5Cl$

| °C | Mol % A |
|---|---|
| −78.95 | 32.2(satd. soln.) 99.70 (satd. vapor) |

**19.** B = $C_2H_6O$
Methyl ether
*See* Fig. 19, p. 213

**20.** (49)
B = $C_4H_{10}O$
Ethyl ether

| °C | Mol % A |
|---|---|
| −78.62 | 47.4 |
| −83.5 | 45.4 |
| −92.5 | 36.6 |
| −98.0 | 30.6 |
| 99.935 % in the satd. vapor | |

### $CS_2$

**21.** (385)
B = $C_2H_4O_2$
Acetic acid

| 16.7 | 0 |
|---|---|
| 12.2 | 10 |
| 9.6 | 20 |
| 8.6 | 30 |
| 8.0 | 40 |
| 7.9 | 50 |

**22.** *v.* p. 172
B = $C_6H_4Br_2$
*p*-Dibromobenzene

**23.** (430)
B = $C_6H_5NO_2$

| °C | Wt. % B |
|---|---|
| 5.22 | 100 |
| 3.85 | 98 |
| 2.62 | 96 |
| 1.53 | 94 |
| +0.54 | 92 |
| −0.46 | 90 |

**24.** (385)
B = $C_6H_6$

| °C | Mol % A |
|---|---|
| + 5.5 | 0 |
| − 1.0 | 10 |
| − 7.2 | 20 |
| −14.1 | 30 |
| −21.1 | 40 |
| −28.5 | 50 |
| −36.5 | 60 |
| −46.1 | 70 |
| −58.4 | 80 |
| −72.7 | 90 |

**25.** (443)
B = $C_7H_5N_5O_8$
Trinitrophenylmethylnitroamine (Tetryl)

| °C | g B per 100 g A |
|---|---|
| 0 | 0.0090 |
| 10 | 0.0146 |
| 20 | 0.0208 |
| 30 | 0.0296 |
| 40 | 0.0557 |

**26.**
B = $C_8H_4O_3$
Phthalic anhydride
*v.* Seidell, p. 491

**27.** (2, 112)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % B |
|---|---|
| 0.0 | 13.0 |
| 10.0 | 18.3 |
| 20.0 | 25.2 |
| 30.0 | 33.8 |
| 40.0 | 44.1 |
| 50.0 | 54.4 |
| 60.0 | 69.3 |
| 70.0 | 84.5 |
| 80.1 | 100.0 |

**28.** *v.* p. 172
B = $C_{12}H_9N$
Carbazole

**29.** *v.* p. 172
B = $C_{12}H_{10}$
Acenaphthene

**30.** *v.* p. 172
B = $C_{14}H_{10}$
Anthracene

**31.** *v.* p. 172
B = $C_{14}H_{10}$
Phenanthrene

**32.**
B = $C_{19}H_{16}$
Triphenylmethane
*v.* Seidell, p. 434

### $CHBr_3$

**33.** *v.* p. 172
B = $C_6H_6$

**34.** *v.* p. 172
B = $C_7H_8$
Toluene

### $CHCl_3$

**35.** (207.5)
B = $CH_2Cl_2$
Methylene chloride

| °C | Wt. % A |
|---|---|
| | A |
| − 63.7 | 100 |
| − 68.5 | 90 |
| − 73.8 | 80 |
| − 79.5 | 70 |
| − 85.5 | 60 |
| − 92.4 | 50 |
| −100.0 | 40 |
| −108.0 | 30 |
| | A + B |
| −108.4E | 29.5 |
| | B |
| −105.0 | 20 |
| −101.7 | 10 |
| − 98.3 | 0 |

**36.** (207.5)
B = $C_2HCl_3$
Trichloroethylene

| | A |
|---|---|
| − 63.7 | 100 |
| − 68.0 | 90 |
| − 72.2 | 80 |
| − 76.5 | 70 |
| − 81.3 | 60 |
| − 87.2 | 50 |
| − 93.8 | 40 |

36.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A + B | |
| −100.2E | 31.2 |
| B | |
| − 99.8 | 30 |
| − 95.6 | 20 |
| − 91.5 | 10 |
| − 87.6 | 0 |

37. (436)
B = $C_2H_3Cl_3O_2$
Chloral hydrate

| °C | Mol % A |
|---|---|
| 51.5 | 0 |
| 45.0 | 10 |
| 39.5 | 20 |
| 36.0 | 30 |
| 34.0 | 40 |
| 32.0 | 50 |
| 30.0 | 60 |
| 27.5 | 70 |
| 24.0 | 80 |
| 17.0 | 90 |

39. *v.* p. 172
B = $C_3H_7NO_2$
Urethane

40. (477)
B = $C_4H_4O_4$
Fumaric acid

| °C | g B per 100 g A |
|---|---|
| 25.0 | 0.02 |

41. (477)
B = $C_4H_4O_4$
Maleic acid

| 25.0 | 0.011 |
|---|---|

42. (433)
B = $C_4H_{10}O$
Ethyl ether

| °C | Mol % A |
|---|---|
| A | |
| − 66.5 | 100 |
| A + $A_2B$ | |
| − 95.0E | 70 |
| $A_2B$ | |
| **− 93.3** | **66** |
| $A_2B$ + AB | |
| − 97.4E | 59.5 |
| AB | |
| **− 94.4** | **50** |
| AB + $AB_2$ | |
| −113.8U | 28 |
| $AB_2$ + B | |
| −121.7E | 15 |
| B | |
| −116.4 | 0 |

43.
B = $C_6H_4N_2O_4$
*m*-Dinitrobenzene
*v.* Seidell, p. 131

44. (482)
B = $C_6H_6$

| °C | Mol % A |
|---|---|
| A | |
| −63.5 | 100 |
| −68.5 | 90 |
| −76.5 | 80 |
| A + B | |
| −80.0E | 76 |
| B | |
| −69.5 | 70 |
| −53.0 | 60 |
| −38.5 | 50 |
| −27.0 | 40 |
| −17.5 | 30 |
| − 9.5 | 20 |
| − 1.7 | 10 |
| + 5.0 | 0 |

45. *v.* p. 172
B = $C_6H_7N$
Aniline

46.
B = $C_7H_5NO_4$
*o*-Nitrobenzoic acid
*v.* Seidell, p. 141

47.
B = $C_7H_5NO_4$
*m*-Nitrobenzoic acid
*v.* Seidell, p. 141

48.
B = $C_7H_5NO_4$
*p*-Nitrobenzoic acid
*v.* Seidell, p. 141

49. (443)
B = $C_7H_5N_5O_8$
Trinitrophenylmethylnitroamine (Tetryl)

| °C | g B per 100 g A |
|---|---|
| 0 | 0.28 |
| 10 | 0.39 |
| 20 | 0.57 |
| 30 | 0.79 |
| 40 | 1.20 |
| 50 | 1.78 |
| 60 | 2.65 |

50.
B = $C_8H_{10}N_4O_2$
Caffeine
*v.* Seidell, p. 186

51. *v.* p. 172
B = $C_{10}H_8$
Naphthalene

51.1. (475)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Mol % A |
|---|---|
| −11.0 | 70 |
| + 5.0 | 60 |
| 14.0 | 50 |
| 21.8 | 40 |
| 28.8 | 30 |
| 35.6 | 20 |

51.1.—(*Continued*)

| °C | Mol % A |
|---|---|
| 42.0 | 10 |
| 45.5 | 5 |
| 49.4 | 0 |

51.2. (71.1)
B = $C_{10}H_{16}O$
Camphor

| °C | g B per 100 g A |
|---|---|
| 0.4 | 200.0 |
| 25.0 | 220.0 |
| 59.2 | 289.0 |

52. *v.* p. 172
B = $C_{12}H_{10}$
Acenaphthene

53. *v.* p. 172
B = $C_{14}H_8O_2$
Anthraquinone

54. *v.* p. 172
B = $C_{14}H_{10}$
Phenanthrene
*v. also* 1

## $CH_2Cl_2$
Methylene chloride
*v.* 35

## $CH_2N_2$
Cyanamide
55. (391)
B = $CH_4N_2O$
Urea

| °C | Wt. % A |
|---|---|
| A | |
| 42.9 | 100 |
| 38.5 | 90 |
| 32.5 | 80 |
| 24.2 | 70 |
| A + B | |
| 17.4E | 63.9 |
| B | |
| 32.5 | 60 |
| 54.7 | 50 |
| 73.0 | 40 |
| 89.5 | 30 |
| 132.0 | 0 |

56. (391)
B = $C_2H_4N_4$
Dicyandiamide

| A | |
|---|---|
| 42.9 | 100 |
| 40.7 | 95 |
| 38.5 | 90 |
| 37.5 | 85 |
| A + B | |
| 35.6E | 85 |
| B | |
| 67.0 | 80 |
| 85.0 | 75 |
| 205.0 | 0 |

## $CH_2O_2$
Formic acid
57. (111)
B = $CH_3NO$
Formamide

| °C | Mol % A |
|---|---|
| A | |
| 7.77 | 100 |
| + 0.2 | 90 |
| − 9.7 | 80 |
| A + AB | |
| −16.8E | 75 |
| AB | |
| −10.7 | 70 |
| − 2.0 | 60 |
| **+ 1.1** | **50** |
| − 1.0 | 40 |
| − 9.3 | 30 |
| AB + B | |
| −18.3E | 23.25 |
| B | |
| −14.8 | 20 |
| − 5.2 | 10 |
| + 2.05 | 0 |

58. (41)
B = $CH_5NO_2$
Ammonium formate

| °C | Mol % B |
|---|---|
| A | |
| 8.47 | 0.0 |
| 7.0 | 1.53 |
| 4.5 | 3.70 |
| + 0.6 | 6.28 |
| − 2.8 | 8.19 |
| − 6.9 | 10.14 |
| −12.6 | 12.43 |
| −19.8 | 14.86 |
| −26.9 | 17.11 |
| A + $A_3B$ | |
| −33.8E | 18.95 |
| $A_3B$ | |
| −31.3 | 20.43 |
| −30.0 | 21.73 |
| $A_3B$ + α-AB | |
| −29.5U | 23.0 |
| α-AB (Needles) | |
| −13.7 | 26.64 |
| − 8.7 | 27.90 |
| + 0.7 | 30.11 |
| 10.4 | 33.25 |
| 17.3 | 36.29 |
| 22.2 | 39.30 |
| 24.9 | 41.90 |
| 25.8 | 42.94 |
| α-AB + B | |
| 29.3U | 46 |
| B | |
| 37.5 | 47.87 |
| 53.1 | 51.88 |
| 74.3 | 59.98 |
| 89.5 | 68.23 |
| 96.5 | 74.32 |
| 98.5 | 76.20 |
| 103.7 | 83.46 |
| 108.5 | 88.41 |
| 111.7 | 91.64 |
| 117.3 | 100.0 |

58.—(*Continued*)

| °C | Mol % B |
|---|---|
| $A_3B$ | |
| −29.3m | 23.33 |
| $A_3B$ + β-AB | |
| −29.0Um | 24 |
| β-AB (Prisms) | |
| −32.5m | 23.33 |
| −26.0m | 24.80 |
| −23.5m | 25.41 |
| −18.7m | 26.64 |
| −14.0m | 27.90 |
| + 1.3m | 33.25 |
| 7.4m | 36.29 |
| 11.3m | 39.30 |
| 13.8m | 41.90 |
| 15.0m | 44.38 |
| β-AB + B | |
| 14.3mU | 43 |
| B | |
| 20.4m | 44.38 |

59. (20)
B = $C_2H_4O_2$
Acetic acid

| °C | Mol % A |
|---|---|
| A | |
| 8.4 | 100 |
| + 2.8 | 90 |
| − 2.9 | 80 |
| − 9.3 | 70 |
| −16.6 | 60 |
| A + B | |
| −22.5E | 53.5 |
| B | |
| −19.5 | 50 |
| −11.0 | 40 |
| − 3.1 | 30 |
| + 4.0 | 20 |
| 10.7 | 10 |
| 16.7 | 0 |

60. (56)
B = $C_6H_4ClNO_2$
*o*-Chloronitrobenzene

| A | |
|---|---|
| 7.1 | 100 |
| A + B | |
| 5.5E | 97 |
| B | |
| 32.1 | 0 |

61. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| A | |
|---|---|
| 8.5 | 100 |
| + 3.8 | 95 |
| − 2.5 | 80 |
| A + $A_2B$ | |
| − 6.6E | 87 |
| $A_2B$ | |
| − 1.4 | 85 |
| + 8.6 | 80 |
| 15.2 | 75 |
| 18.4 | 70 |
| **19** | **66** |

61.—(*Continued*)

| °C | Mol % A |
|---|---|
| $A_2B$ | |
| 18.8 | 65 |
| $A_2B$ + $A_3B_2$ | |
| 18.5E | 64 |
| $A_3B_2$ | |
| **19.6** | **60** |
| $A_3B_2$ + B | |
| 19.0E | 57 |
| B | |
| 29.5 | 55 |
| 54.3 | 50 |
| 72.2 | 45 |
| 85.8 | 40 |
| 96.0 | 35 |
| 104.3 | 30 |
| 111.2 | 25 |
| 117.0 | 20 |
| 126.0 | 10 |
| 132.1 | 0 |

## $CH_3Cl$
62. (24)
B = $CH_4O$

| °C | Mol % A |
|---|---|
| A | |
| −93 | 100 |
| A + B | |
| −112.0E | 24.2 |
| B | |
| −94 | 0 |

63. (23)
B = $C_2H_6O$
Methyl ether

| A | |
|---|---|
| − 94.5 | 100 |
| A + B | |
| −154E | 27.0 |
| B | |
| −138.5 | 0 |

## $CH_3NO$
Formamide
64. (111)
B = $C_2H_4O_2$
Acetic acid

| A | |
|---|---|
| + 2.05 | 100 |
| − 4.9 | 90 |
| −14.8 | 80 |
| −26.2 | 70 |
| A + $AB_2$ | |
| −29.5E | 67.5 |
| $AB_2$ | |
| −21.2 | 60 |
| −12.9 | 50 |
| − 8.7 | 40 |
| **− 8.1** | **33** |
| $AB_2$ + B | |
| − 8.2E | 32 |
| B | |
| − 6.4 | 30 |
| + 2.9 | 20 |
| 10.4 | 10 |
| 16.6 | 0 |

## $CH_3NO$.—(*Continued*)

65. (111)
B = $C_3H_6O_2$
Propionic acid

| °C | Mol % A |
|---|---|
| A | |
| + 2.07 | 100 |
| − 4.4 | 90 |
| −12.6 | 80 |
| A + $A_2B$ | |
| −17.3E | 75 |
| $A_2B$ | |
| −12.2 | 70 |
| **−11.6** | **66** |
| −12.8 | 60 |
| $A_2B$ + AB | |
| −21.8E | 50 |
| AB | |
| **−21.8** | **50** |
| −29.0 | 40 |
| AB + B | |
| −39.5E | 36 |
| B | |
| −35.0 | 30 |
| −28.9 | 20 |
| −24.6 | 10 |
| −20.71 | 0 |

66. (111)
B = $C_4H_8O_2$
*n*-Butyric acid

| A | |
|---|---|
| + 2.05 | 100 |
| − 3.7 | 90 |
| −10.1 | 80 |
| A + $A_2B$ | |
| −14.3E | 74 |
| $A_2B$ | |
| −12.8 | 70 |
| **−12.2** | **66.6** |
| −13.2 | 60 |
| −21.5 | 50 |
| $A_2B$ + AB | |
| −24.5U | 48.5 |
| AB + B | |
| −24.9E | 43.0 |
| B | |
| −22.7 | 40 |
| −16.9 | 30 |
| −12.3 | 20 |
| − 8.3 | 10 |
| − 4.67 | 0 |

*v. also* 57

## $CH_4N_2O$
Urea

67. B = $CH_4O$
*v.* Seidell, p. 737

68. B = $C_2H_6O$
Ethyl alcohol
*v.* Seidell, p. 737

69. B = $C_3H_8O$
Propyl alcohol
*v.* Seidell, p. 737

70. B = $C_3H_8O$
Isopropyl alcohol
*v.* Seidell, p. 737

71. B = $C_4H_{10}O$
Isobutyl alcohol
*v.* Seidell, p. 737

72. B = $C_5H_{12}O$
Isoamyl alcohol
*v.* Seidell, p. 737

73. (256)
B = $C_6H_4N_2O_4$
*o*-Dinitrobenzene

| °C | Wt. % A |
|---|---|
| A | |
| 131.5 | 100 |
| 129.5 | 98.5 |
| immiscible | to |
| liquids | |
| 129.5 | 1.0 |
| A + B | |
| 114.1E | 0.5 |
| B | |
| 114.8 | 0 |

74. (256)
B = $C_6H_4N_2O_4$
*m*-Dinitrobenzene

| A | |
|---|---|
| 131.5 | 100 |
| 129.0 | 98 |
| immiscible | to |
| liquids | |
| 129.0 | 2 |
| A + B | |
| 88.8E | 0.2 |
| B | |
| 89 | 0 |

75. (256)
B = $C_6H_4N_2O_4$
*p*-Dinitrobenzene

| A | |
|---|---|
| 131.5 | 100 |
| A + B | |
| 125.0 | 95 |
| 164.0 | 91 |
| immiscible | to |
| liquids | |
| 164.0 | 3 |
| B | |
| 169.5 | 0 |

76. (259, 381)
B = $C_6H_6O$
Phenol

| °C | Mol % A |
|---|---|
| A | |
| 131.5 | 100 |
| 125.2 | 90 |
| 118.8 | 80 |
| 111.5 | 70 |
| 102.4 | 60 |

76.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 90.0 | 50 |
| 74.0 | 40 |
| A + $AB_2$ | |
| 60.6E | 33.4 |
| $AB_2$ | |
| **60.6** | **33.4** |
| 60.4 | 30 |
| 55.3 | 20 |
| 49.8 | 15 |
| 42.0 | 10 |
| $AB_2$ + B | |
| 35E | 6.5 |
| B | |
| 36.3 | 5 |
| 40.5 | 0 |

77. (256)
B = $C_7H_6N_2O_4$
2, 4-Dinitrotoluene

| °C | Wt. % A |
|---|---|
| A | |
| 131.3 | 100 |
| 130.0 | 99 |
| immiscible | to |
| liquids | |
| 130.0 | 1.0 |
| A + B | |
| 69.4E | 0.1 |
| B | |
| 69.5 | 0 |

78. (226)
B = $C_7H_8O$
*o*-Cresol

| °C | Mol % A |
|---|---|
| A | |
| 131.5 | 100 |
| 127.3 | 90 |
| 124.4 | 80 |
| 121.1 | 70 |
| 116.2 | 60 |
| 108.4 | 50 |
| 95.0 | 40 |
| 69.0 | 30 |
| A + AB | |
| 60U | 27.8 |
| AB | |
| 52.5 | 20 |
| 43.0 | 15 |
| 28.5 | 10 |
| AB + B | |
| 25E | 9 |
| B | |
| 27.7 | 5 |
| 31.0 | 0 |

79. (226)
B = $C_7H_8O$
*m*-Cresol

| °C | Mol % A |
|---|---|
| A | |
| 131.5 | 100 |
| 126.6 | 90 |
| 123.8 | 80 |
| 120.5 | 70 |
| 116.2 | 60 |

79.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 108.0 | 50 |
| 92.5 | 40 |
| 69.0 | 30 |
| A + AB | |
| 66.0U | 29 |
| AB | |
| 56.7 | 20 |
| 47.0 | 15 |
| 33.0 | 10 |
| AB + B | |
| *ca.* 2.5E | *ca.* 2 |
| B | |
| 4 | 0 |

80. (226)
B = $C_7H_8O$
*p*-Cresol

| A | |
|---|---|
| 131.5 | 100 |
| 126.5 | 90 |
| 122.6 | 80 |
| 118.8 | 70 |
| 114.3 | 60 |
| 108.0 | 50 |
| 93.0 | 40 |
| 66.5 | 30 |
| A + AB | |
| 25.5U | 21 |
| AB | |
| 25.2 | 20 |
| AB + B | |
| 20.5E | 16 |
| B | |
| 21.5 | 15 |
| 26.5 | 10 |
| 31.0 | 5 |
| 34.5 | 0 |

81.
B = $C_8H_{18}O$
Octyl alcohol
*v.* Seidell, p. 737

*v. also* 55

## $CH_4N_2S$
Ammonium thiocyanate

81.5.
B = $CH_4N_2S$
Thiourea
*See* Fig. 20, p. 213.

## $CH_4O$

82. (385)
B = $C_2H_4O_2$
Acetic acid

| °C | Mol % A |
|---|---|
| 16.7 | 0 |
| 11.0 | 10 |
| + 4.6 | 20 |
| − 3.0 | 30 |
| −12.7 | 40 |
| −24.7 | 50 |
| −39.2 | 60 |
| −63.2 | 70 |

83. (28)
B = $C_3H_6O_2$
Propionic acid

| °C | Mol % A |
|---|---|
| A | |
| −94.5 | 100 |
| A + B | |
| −97.7E | 96 |
| B | |
| −19.5 | 0 |

84. (28)
B = $C_3H_7ClO_2$
Propionic acid hydrochloride

| A | |
|---|---|
| − 94.8 | 100 |
| A + AB | |
| −105.0E | *ca.* 95 |
| AB | |
| **− 36** | **50** |
| AB + B | |
| − 46E | *ca.* 36.0 |
| B | |
| − 40 *ca.* | 0 |

*v. also* Fig. 21, p. 213

85. *v.* p. 172
B = $C_3H_7NO_2$
Urethane

86.
B = $C_5H_{11}NO_2$
Betaine
*v.* Seidell, p. 149

87. (385)
B = $C_6H_6$

| °C | Mol % A |
|---|---|
| 5.5 | 0 |
| 3.8 | 10 |
| 2.4 | 20 |
| 1.5 | 30 |
| 0.9 | 40 |
| + 0.1 | 50 |
| − 1.55 | 60 |
| − 4.9 | 70 |
| −11.7 | 80 |
| −30.7 | 90 |
| −40.8 | 92.5 |
| −53.5 | 95 |
| −70.0 | 97.5 |

88.
B = $C_7H_5NO_4$
*o*-Nitrobenzoic acid
*v.* Seidell, p. 141, 143

89.
B = $C_7H_5NO_4$
*m*-Nitrobenzoic acid
*v.* Seidell, p. 141, 143

90.
B = $C_7H_5NO_4$
*p*-Nitrobenzoic acid
*v.* Seidell, p. 141, 144

91. B = $C_7H_6O_2$
Benzoic acid
*v.* Seidell, p. 135

92. B = $C_7H_6O_3$
Salicylic acid
*v.* Seidell, p. 591

93. B = $C_8H_6O_4$
*o*-Phthalic acid
*v.* Seidell, p. 490

94. B = $C_8H_8O_2$
Phenylacetic acid
*v.* Seidell, p. 12

95. B = $C_8H_8O_3$
*dl*-Mandelic acid
*v.* Seidell, p. 399

96. *v.* p. 173
B = $C_8H_9NO$
Acetanilide

97.
B = $C_9H_{10}O_2$
Hydrocinnamic acid
*v.* Seidell, p. 570

98. (436, 452, 475)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % B |
|---|---|
| 0.0 | 0.9 |
| 10.0 | 1.4 |
| 20.0 | 2.0 |
| 30.0 | 2.8 |
| 40.0 | 4.3 |
| 50.0 | 7.0 |
| 60.0 | 13.0 |

98.1. (475)
B = $C_{10}H_9N$
$\beta$-Naphthylamine

| °C | Mol % A |
|---|---|
| 10.0 | 97.5 |
| 42.0 | 95 |
| 58.5 | 90 |
| 71.0 | 80 |
| 77.4 | 70 |
| 82.2 | 60 |
| 87.5 | 50 |
| 92.0 | 40 |
| 110.6 | 0 |

99.
B = $C_{10}H_{16}O_4$
Camphoric acid
*v.* Seidell, p. 225

100. (436)
B = $C_{12}H_{10}$
Acenaphthene

| °C | Mol % B |
|---|---|
| 0.0 | 0.26 |
| 10.0 | 0.35 |
| 20.0 | 0.49 |
| 30.0 | 0.71 |
| 40.0 | 1.07 |
| 50.0 | 1.74 |

101.
B = $C_{12}H_{10}N_2$
Azobenzene
*v.* Seidell, p. 103

102.
B = $C_{12}H_{24}O_2$
Lauric acid
*v.* Seidell, p. 349

103. (345)
B = $C_{13}H_{10}$
Fluorene

| °C | Mol % B |
|---|---|
| 10.0 | 0.27 |
| 20.0 | 0.35 |
| 30.0 | 0.46 |
| 40.0 | 0.58 |
| 50.0 | 0.74 |
| 60.0 | 1.10 |

104.
B = $C_{13}H_{10}O$
Benzophenone
*v.* Seidell, p. 146

105. *v.* p. 173
B = $C_{14}H_8O_2$
Anthraquinone

106. *v.* p. 173
B = $C_{14}H_{10}$
Anthracene

107. (153, 475)
B = $C_{14}H_{10}$
Phenanthrene

| °C | g B per 100 g A |
|---|---|
| 20.0 | 2.3 |
| 30.0 | 3.3 |
| 40.0 | 5.0 |
| 50.0 | 7.5 |
| 60.0 | 10.9 |

108
B = $C_{14}H_{28}O_2$
Myristic acid
*v.* Seidell, p. 443

109.
B = $C_{16}H_{32}O_2$
Palmitic acid
*v.* Seidell, p. 474

*v. also* 17, 62, 67

## $CH_5ClO$
Methyl alcohol hydrochloride
110. (28)
B = $C_3H_6O_2$
Propionic acid

| °C | Mol % A |
|---|---|
| A | |
| −65.2 | 100 |
| A + $AB_2$ | |
| −72E | *ca.* 80 |
| B | |
| −19.7 | 0 |

## $CH_5NO_2$
Ammonium formate
*v.* 58

## $C_2Cl_6$
Hexachloroethane
111. (362)
B = $C_{10}H_8$
Naphthalene

| °C | Wt. % A |
|---|---|
| αA | |
| 187.0 | 100 |
| αA + βA | |
| 125.0U | 78.0 |
| βA + γA | |
| 71.6U | 61.0 |
| γA + B | |
| 56.5E | 52.5 |
| B | |
| 80.0 | 0 |

112. (362)
B = $C_{14}H_{10}$
Phenanthrene

| | |
|---|---|
| αA | |
| 187.0 | 100 |
| αA + βA | |
| 125.0U | 82.0 |
| βA + γA | |
| 71.6U | 55.0 |
| γA + B | |
| 65.6E | 48.0 |
| B | |
| 99.0 | 0 |

## $C_2HCl_3$
Trichloroethylene
113.
B = $C_7H_6O_2$
Benzoic acid
*v.* Seidell, p. 136

*v. also* 36

## $C_2HCl_3O$
Chloral
114. (299)
B = $C_2H_6O$
Ethyl alcohol

| °C | Mol % A |
|---|---|
| A | |
| − 57.5 | 100 |
| A + AB | |
| − 55.5E | 98.5 |
| AB | |
| **46.6** | **50** |
| AB + B | |
| ?E | ? |
| B | |
| −130.5 | 0 |

## $C_2HCl_3O_2$
Trichloroacetic acid
115. (209)
B = $C_2H_2Cl_2O_2$
Dichloroacetic acid

115.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 57.3 | 100 |
| 50.8 | 90 |
| 47.2 | 85 |
| 43.3 | 80 |
| 39.2 | 75 |
| 34.8 | 70 |
| 29.2 | 65 |
| 23.2 | 60 |
| 16.6 | 55 |
| 9.4 | 50 |
| + 2.2 | 45 |
| − 5.2 | 40 |
| A + B | |
| −11.0E | 36.0 |
| B | |
| − 6.9 | 30 |
| − 0.4 | 20 |
| + 5.2 | 10 |
| 9.7 | 0 |

116. (209)
B = $C_2H_3ClO_2$
Chloroacetic acid

| | |
|---|---|
| A | |
| 57.3 | 100 |
| 50.7 | 90 |
| 46.9 | 85 |
| 43.0 | 80 |
| 39.0 | 75 |
| 34.8 | 70 |
| 30.3 | 65 |
| 25.7 | 60 |
| 20.9 | 55 |
| A + B | |
| 17.5E | 51.5 |
| B | |
| 20.1 | 50 |
| 26.9 | 45 |
| 33.0 | 40 |
| 42.8 | 30 |
| 50.3 | 20 |
| 56.6 | 10 |
| 61.4 | 0 |

117. (209)
B = $C_2H_4O_2$
Acetic acid

| | |
|---|---|
| 57.3 | 100 |
| 49.6 | 90 |
| 45.2 | 85 |
| 40.4 | 80 |
| 35.0 | 75 |
| 28.7 | 70 |
| 21.5 | 65 |
| 12.7 | 60 |
| + 2.5 | 55 |
| −10.5 | 50 |
| −27.0 | 45 |
| ? | 40 |
| −22.7 | 30 |
| − 3.2 | 20 |
| + 8.7 | 10 |
| 16.4 | 0 |

118. (209)
B = $C_4H_6O_2$
Crotonic acid

| °C | Mol % A |
|---|---|
| A | |
| 57.3 | 100 |
| 49.7 | 90 |
| 45.2 | 85 |
| 39.5 | 80 |
| 32.7 | 75 |
| 25.0 | 70 |
| 15.6 | 65 |
| + 3.0 | 60 |
| −12.0 | 55 |
| A + B | |
| −19E | *ca.* 53 |
| B | |
| − 9.5 | 50 |
| + 4.3 | 45 |
| 16.1 | 40 |
| 35.2 | 30 |
| 50.3 | 20 |
| 62.5 | 10 |
| 71.0 | 0 |

119. (212)
B = $C_4H_6O_4$
Dimethyl oxalate

| | |
|---|---|
| A | |
| 58.0 | 100 |
| 49.4 | 90 |
| 37.9 | 80 |
| 30.6 | 75 |
| 22.5 | 70 |
| 13.3 | 65 |
| + 2.5 | 60 |
| A + B | |
| − 3.5E | *ca.* 57.5 |
| B | |
| + 1.7 | 55 |
| 10.4 | 50 |
| 17.8 | 45 |
| 24.1 | 40 |
| 29.7 | 35 |
| 34.5 | 30 |
| 38.7 | 25 |
| 42.5 | 20 |
| 45.8 | 15 |
| 48.7 | 10 |
| 51.2 | 5 |
| 53.3 | 0 |

120. (212)
B = $C_4H_8O_2$
Ethyl acetate

| | |
|---|---|
| A | |
| 58.0 | 100 |
| 50.4 | 90 |
| 38.8 | 80 |
| 30.0 | 75 |
| 18.3 | 70 |
| + 2.5 | 65 |
| −18.2 | 60 |
| A + AB | |
| −30E | 58 |

120.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB | |
| −29.2 | 55 |
| **−27.5** | **50** |
| −29.5 | 45 |
| −32.6 | 40 |
| −36.7 | 35 |
| −41.5 | 30 |
| −47.5 | 25 |
| −55.8 | 20 |
| −66.0 | 15 |
| −78.2 | 10 |
| AB + B | |
| −90E | 6 |
| B | |
| −89.1 | 5 |
| −83.0 | 0 |

121. (212)
B = $C_5H_8O_4$
Dimethyl malonate

| | |
|---|---|
| A | |
| 58.0 | 100 |
| 48.0 | 90 |
| 30.7 | 80 |
| 19.0 | 75 |
| + 4.1 | 70 |
| −15.0 | 65 |
| A + $A_2B$ | |
| −30.0U | 60 |
| $A_2B$ | |
| −33.4 | 55 |
| −39.0 | 50 |
| −47.2 | 45 |
| −58.0 | 40 |
| B | |
| −62.0 | 0 |

123. (213)
B = $C_6H_4O_2$
Benzoquinone

| | |
|---|---|
| A | |
| 58.0 | 100 |
| 50.7 | 90 |
| 38.7 | 80 |
| 30.5 | 75 |
| 20.9 | 70 |
| 9.9 | 65 |
| A + B | |
| 1.0E | *ca.* 61.5 |
| B | |
| 6.1 | 60 |
| 24.6 | 55 |
| 40.2 | 50 |
| 52.8 | 45 |
| 63.6 | 40 |
| 72.8 | 35 |
| 81.3 | 30 |
| 88.8 | 25 |
| 95.5 | 20 |
| 101.3 | 15 |
| 106.3 | 10 |
| 114.6 | 0 |

124. (210)
B = $C_6H_5NO_3$
*o*-Nitrophenol

124.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 58.0 | 100 |
| 51.3 | 90 |
| 43.8 | 80 |
| 39.8 | 75 |
| 35.5 | 70 |
| 30.9 | 65 |
| 26.3 | 60 |
| 21.4 | 55 |
| A + B | |
| 16.8E | 50 |
| B | |
| 20.2 | 45 |
| 23.5 | 40 |
| 26.7 | 35 |
| 29.7 | 30 |
| 32.5 | 25 |
| 35.3 | 20 |
| 37.8 | 15 |
| 40.3 | 10 |
| 42.6 | 5 |
| 44.7 | 0 |

125. (210)
B = $C_6H_5NO_3$
*m*-Nitrophenol

| | |
|---|---|
| A | |
| 58.0 | 100 |
| 51.8 | 90 |
| 45.7 | 80 |
| 42.8 | 75 |
| A + B | |
| 41.5E | *ca.* 73 |
| B | |
| 44.8 | 70 |
| 49.9 | 65 |
| 54.7 | 60 |
| 59.3 | 55 |
| 63.6 | 50 |
| 67.5 | 45 |
| 71.3 | 40 |
| 74.8 | 35 |
| 78.2 | 30 |
| 81.3 | 25 |
| 84.5 | 20 |
| 87.3 | 15 |
| 90.1 | 10 |
| 92.7 | 5 |
| 95.3 | 0 |

126. (210)
B = $C_6H_5NO_3$
*p*-Nitrophenol

| | |
|---|---|
| A | |
| 58.0 | 100 |
| 52.6 | 90 |
| 46.7 | 80 |
| A + B | |
| 44.0E | *ca.* 76 |
| B | |
| 45.5 | 75 |
| 51.6 | 70 |
| 57.6 | 65 |
| 63.6 | 60 |
| 69.5 | 55 |
| 75.0 | 50 |

$C_2HCl_3O_2$.—(*Continued*)

126.—(*Continued*)

| °C | Mol % A |
|---|---|
| | B |
| 80.1 | 45 |
| 84.7 | 40 |
| 89.0 | 35 |
| 93.0 | 30 |
| 96.8 | 25 |
| 100.4 | 20 |
| 104.3 | 15 |
| 107.7 | 10 |
| 110.8 | 5 |
| 113.8 | 0 |

127. (212)
B = $C_6H_6$

| | |
|---|---|
| | A |
| 58.0 | 100 |
| 51.3 | 90 |
| 44.4 | 80 |
| 40.7 | 75 |
| 36.9 | 70 |
| 33.0 | 65 |
| 29.1 | 60 |
| 24.9 | 55 |
| 20.6 | 50 |
| 16.3 | 45 |
| 11.8 | 40 |
| 7.2 | 35 |
| +2.5 | 30 |
| −2.5 | 25 |
| | A + B |
| −4.0E | 23.5 |
| | B |
| −2.4 | 20 |
| −0.4 | 15 |
| +1.7 | 10 |
| 3.7 | 5 |
| 5.4 | 0 |

128. (210)
B = $C_6H_6O$
Phenol

| | |
|---|---|
| | A |
| 58.0 | 100 |
| 51.1 | 90 |
| 42.8 | 80 |
| 38.2 | 75 |
| 33.4 | 70 |
| | A + AB |
| 32.0E | 68.5 |
| | AB |
| 34.0 | 65 |
| 35.8 | 60 |
| 37.2 | 55 |
| **37.6** | **50** |
| 37.2 | 45 |
| 35.8 | 40 |
| 33.8 | 35 |
| 31.2 | 30 |
| 28.2 | 25 |
| 25.0 | 20 |
| | AB + B |
| 24.8E | 19.7 |

128.—(*Continued*)

| °C | Mol % A |
|---|---|
| | B |
| 29.6 | 15 |
| 34.4 | 10 |
| 38.8 | 5 |
| 42.4 | 0 |

129. (212)
B = $C_6H_{10}O_4$
Dimethyl succinate

| | |
|---|---|
| | A |
| 58.0 | 100 |
| 47.6 | 90 |
| 26.6 | 80 |
| 11.7 | 75 |
| | A + $A_2B$ |
| 5.0E | 73 |
| | $A_2B$ |
| 6.8 | 70 |
| **8.0** | **66** |
| 7.8 | 65 |
| 5.7 | 60 |
| + 1.7 | 55 |
| − 3.7 | 50 |
| −10.5 | 45 |
| | $A_2B$ + B |
| −14.0E | 43 |
| | B |
| −10.0 | 40 |
| − 4.0 | 35 |
| + 1.7 | 30 |
| 6.1 | 25 |
| 9.5 | 20 |
| 12.5 | 15 |
| 14.8 | 10 |
| 16.7 | 5 |
| 18.2 | 0 |

130. (212)
B = $C_6H_{10}O_4$
Diethyl oxalate

| | |
|---|---|
| | A |
| 58.0 | 100 |
| 48.3 | 90 |
| 33.3 | 80 |
| 23.3 | 75 |
| 11.0 | 70 |
| | A + $A_2B$ |
| 3.3E | 67.2 |
| | $A_2B$ |
| **3.4** | **66.7** |
| 3.3 | 65 |
| + 1.7 | 60 |
| − 1.4 | 55 |
| − 5.8 | 50 |
| −11.7 | 45 |
| −18.7 | 40 |
| −27.1 | 35 |
| −36.6 | 30 |
| −47.2 | 25 |
| | $A_2B$ + B |
| −50.0E | 23.5 |
| | B |
| −48.0 | 20 |
| −45.3 | 15 |
| −43.4 | 10 |
| −42.0 | 5 |
| −41.0 | 0 |

131. (213)
B = $C_7H_5NO_2$
*o*-Nitrobenzaldehyde

| °C | Mol % A |
|---|---|
| | A |
| 58.0 | 100 |
| 52.5 | 90 |
| 44.5 | 80 |
| 39.7 | 75 |
| 33.8 | 70 |
| 27.6 | 65 |
| 20.7 | 60 |
| 13.3 | 55 |
| | A + B |
| 5.5E | 50 |
| | B |
| 11.6 | 45 |
| 17.8 | 40 |
| 23.1 | 35 |
| 27.3 | 30 |
| 30.6 | 25 |
| 33.4 | 20 |
| 36.0 | 15 |
| 38.5 | 10 |
| 42.9 | 0 |

132. (213)
B = $C_7H_5NO_2$
*m*-Nitrobenzaldehyde

| | |
|---|---|
| | A |
| 58.0 | 100 |
| 50.8 | 90 |
| 42.3 | 80 |
| 37.0 | 75 |
| 31.3 | 70 |
| 24.6 | 65 |
| 16.4 | 60 |
| | A + B |
| 11.0E | 57 |
| | B |
| 13.1 | 55 |
| 18.5 | 50 |
| 23.0 | 45 |
| 29.0 | 40 |
| 33.6 | 35 |
| 38.1 | 30 |
| 42.2 | 25 |
| 45.5 | 20 |
| 48.3 | 15 |
| 51.0 | 10 |
| 55.7 | 0 |

133. (213)
B = $C_7H_5NO_3$
*p*-Nitrobenzaldehyde

| | |
|---|---|
| | A |
| 58.0 | 100 |
| 51.2 | 90 |
| 41.9 | 80 |
| 36.8 | 75 |
| 31.4 | 70 |
| | A + B |
| 29.0E | 67.5 |

133.—(*Continued*)

| °C | Mol % A |
|---|---|
| | B |
| 34.6 | 65 |
| 44.5 | 60 |
| 53.3 | 55 |
| 61.2 | 50 |
| 67.5 | 45 |
| 73.3 | 40 |
| 78.7 | 35 |
| 83.8 | 30 |
| 88.3 | 25 |
| 92.1 | 20 |
| 95.4 | 15 |
| 98.6 | 10 |
| 104.4 | 0 |

134. (213)
B = $C_7H_6O$
Benzaldehyde

| | |
|---|---|
| | A |
| 58.0 | 100 |
| 50.1 | 90 |
| 40.2 | 80 |
| 32.8 | 75 |
| 23.5 | 70 |
| 8.4 | 65 |
| | A + AB |
| 1.5E | 63 |
| | AB |
| 4.3 | 60 |
| 7.3 | 55 |
| **8.4** | **50** |
| 7.1 | 45 |
| +4.4 | 40 |
| −0.2 | 35 |
| −6.1 | 30 |

135. (209)
B = $C_7H_6O_2$
Benzoic acid

| | |
|---|---|
| | A |
| 57.3 | 100 |
| 49.8 | 90 |
| 45.4 | 85 |
| 40.2 | 80 |
| 34.6 | 75 |
| 28.3 | 70 |
| | A + AB |
| 26.5E | 68.5 |
| | AB |
| 29.7 | 65 |
| 33.2 | 60 |
| | AB + B |
| 35.0U | 56 |
| | B |
| 37.5 | 55 |
| 50.3 | 50 |
| 62.3 | 45 |
| 73.8 | 40 |
| 92.6 | 30 |
| 105.5 | 20 |
| 114.5 | 10 |
| 121.0 | 0 |

136. B = $C_7H_6O_2$ (213)
*o*-Hydroxybenzaldehyde

| °C | Mol % A |
|---|---|
| | A |
| 58.0 | 100 |
| 50.5 | 90 |
| 40.2 | 80 |
| 33.5 | 75 |
| 26.0 | 70 |
| 16.8 | 65 |
| +5.8 | 60 |
| −7.0 | 55 |

137. B = $C_7H_6O_2$ (213)
*m*-Hydroxybenzaldehyde

| | |
|---|---|
| | A |
| 58.0 | 100 |
| 50.4 | 90 |
| 40.2 | 80 |
| 33.8 | 75 |
| 27.2 | 70 |
| | A + B |
| 22.5E | 66.5 |
| | B |
| 26.3 | 65 |
| 38.4 | 60 |
| 48.7 | 55 |
| 57.8 | 50 |
| 65.6 | 45 |
| 72.8 | 40 |
| 79.1 | 35 |
| 84.8 | 30 |
| 89.8 | 25 |
| 94.3 | 20 |
| 98.4 | 15 |
| 101.8 | 10 |
| 107.4 | 0 |

138. B = $C_7H_6O_2$ (213)
*p*-Hydroxybenzaldehyde

| | |
|---|---|
| | A |
| 58.0 | 100 |
| 51.7 | 90 |
| | A + AB |
| 45.5E | 83 |
| | AB |
| 49.3 | 80 |
| 55.0 | 75 |
| 60.0 | 70 |
| 63.5 | 65 |
| 65.9 | 60 |
| 67.3 | 55 |
| **67.8** | **50** |
| | AB + B |
| 67.7E | 45 |
| | B |
| 76.3 | 40 |
| 83.9 | 35 |
| 90.7 | 30 |
| 96.4 | 25 |
| 101.8 | 20 |
| 106.0 | 15 |
| 109.6 | 10 |
| 115.6 | 0 |

139. (210)
B = $C_7H_8O$
*o*-Cresol

| °C | Mol % A |
|---|---|
| | A |
| 58.0 | 100 |
| 50.7 | 90 |
| 41.9 | 80 |
| 37.2 | 75 |
| 31.8 | 70 |
| 26.1 | 65 |
| | A + AB |
| 24.3E | 63.5 |
| | AB |
| 25.5 | 60 |
| 26.6 | 55 |
| **27.0** | **50** |
| 26.6 | 45 |
| 25.3 | 40 |
| 23.4 | 35 |
| 20.7 | 30 |
| 17.8 | 25 |
| | AB + B |
| 16.0E | 22 |
| | B |
| 17.6 | 20 |
| 21.1 | 15 |
| 24.5 | 10 |
| 27.6 | 5 |
| 30.4 | 0 |

140. (210)
B = $C_7H_8O$
*m*-Cresol

| | |
|---|---|
| | A |
| 58.0 | 100 |
| 51.0 | 90 |
| 42.5 | 80 |
| 37.6 | 75 |
| 32.3 | 70 |
| 26.7 | 65 |
| 20.7 | 60 |
| 14.4 | 55 |
| | A + AB |
| 13.6E | 54.5 |
| | AB |
| **14.5** | **50** |
| 13.9 | 45 |
| 12.7 | 40 |
| 10.7 | 35 |
| 7.6 | 30 |
| +3.5 | 25 |
| −1.5 | 20 |
| | AB + B |
| −2.0E | 18.5 |
| | B |
| −0.2 | 15 |
| +3.6 | 10 |
| 7.3 | 5 |
| 10.9 | 0 |

141. (210)
B = $C_7H_8O$
*p*-Cresol

| | |
|---|---|
| | A |
| 58.0 | 100 |
| 50.8 | 90 |

141.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 42.2 | 80 |
| 37.5 | 75 |
| 32.3 | 70 |
| A + AB | |
| 31.5E | 69.5 |
| AB | |
| 33.9 | 65 |
| 35.8 | 60 |
| 37.2 | 55 |
| **37.6** | **50** |
| 37.1 | 45 |
| 35.7 | 40 |
| 33.3 | 35 |
| 30.2 | 30 |
| 26.2 | 25 |
| 21.5 | 20 |
| AB + B | |
| 19.5E | 18 |
| B | |
| 22.2 | 15 |
| 26.7 | 10 |
| 30.9 | 5 |
| 34.5 | 0 |

142. (208, 386)
B = $C_7H_8O_2$
Dimethylpyrone

| A | |
|---|---|
| 58.0 | 100 |
| 54.0 | 95 |
| 47.6 | 90 |
| 34.7 | 85 |
| A + $A_2B$ | |
| 15.0E | 81.5 |
| $A_2B$ | |
| 36.5 | 80 |
| 53.0 | 75 |
| 63.6 | 70 |
| **66.7** | **66.7** |
| 65.9 | 65 |
| 57.8 | 60 |
| $A_2B$ + AB | |
| 40.0E | 55 |
| AB | |
| **44.8** | **50** |
| AB + B | |
| 41E | 46 |
| B | |
| 49.0 | 45 |
| 79.2 | 40 |
| 96.0 | 35 |
| 107.8 | 30 |
| 115.4 | 25 |
| 120.7 | 20 |
| 124.5 | 15 |
| 127.3 | 10 |
| 132.1 | 0 |

143. (213)
B = $C_8H_5NO_5$
Nitropiperonal

| A | |
|---|---|
| 58 0 | 100 |
| 51.5 | 90 |
| 42.7 | 80 |

143.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 37.7 | 75 |
| 32.5 | 70 |
| A + B | |
| 30.7E | 68.5 |
| B | |
| 35.4 | 65 |
| 42.2 | 60 |
| 48.4 | 55 |
| 54.0 | 50 |
| 59.2 | 45 |
| 64.4 | 40 |
| 69.2 | 35 |
| 73.7 | 30 |
| 77.9 | 25 |
| 81.8 | 20 |
| 85.2 | 15 |
| 88.4 | 10 |
| 94.1 | 0 |

144. (213)
B = $C_8H_6O_3$
Piperonal

| A | |
|---|---|
| 58.0 | 100 |
| 49.7 | 90 |
| 36.2 | 80 |
| A + AB | |
| 30.0E | 77 |
| $A_2B$ | |
| 32.7 | 75 |
| 37.1 | 70 |
| **37.4** | **66** |
| 37.1 | 65 |
| 34.0 | 60 |
| $A_2B$ + AB | |
| 30.5E | 56 |
| AB | |
| 31.5 | 55 |
| **35.0** | **50** |
| 33.6 | 45 |
| 30.3 | 40 |
| 26.6 | 35 |
| 22.3 | 30 |
| AB + B | |
| 18.3E | 25.5 |
| B | |
| 18.7 | 25 |
| 22.6 | 20 |
| 26.3 | 15 |
| 29.8 | 10 |
| 35.5 | 0 |

145. (213)
B = $C_8H_8O$
Acetophenone

| A | |
|---|---|
| 58.0 | 100 |
| 49.2 | 90 |
| 36.7 | 80 |
| 27.7 | 75 |
| 16.5 | 70 |
| A + AB | |
| 14.0E | 69 |

145.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB | |
| 17.1 | 65 |
| 20.8 | 60 |
| 23.9 | 55 |
| **26.0** | **50** |
| 24.5 | 45 |
| 21.3 | 40 |
| 16.5 | 35 |
| 10.6 | 30 |
| 3.7 | 25 |
| AB + B | |
| 1.5E | 23.5 |
| B | |
| 5.0 | 20 |
| 9.7 | 15 |
| 13.4 | 10 |
| 18.7 | 0 |

146. (213)
B = $C_8H_8O_2$
Anisaldehyde

| A | |
|---|---|
| 58.0 | 100 |
| 49.8 | 90 |
| 36.1 | 80 |
| 26.5 | 75 |
| A + AB | |
| 14.5E | 70 |
| AB | |
| 20.6 | 65 |
| 26.1 | 60 |
| 29.6 | 55 |
| **30.9** | **50** |
| 29.3 | 45 |
| 26.3 | 40 |
| 22.0 | 35 |
| 16.2 | 30 |
| 9.5 | 25 |
| +2.2 | 20 |
| −6.1 | 15 |
| AB + B | |
| −9.0E | 13.5 |
| B | |
| −6.8 | 10 |
| −0.9 | 0 |

147. (209)
B = $C_8H_8O_2$
Phenylacetic acid

| A | |
|---|---|
| 57.3 | 100 |
| 50.8 | 90 |
| **46.7** | 85 |
| 41.8 | 80 |
| 36.0 | 75 |
| 29.2 | 70 |
| 21.2 | 65 |
| 12.6 | 60 |
| A + B | |
| 1.5E | 55 |
| B | |
| 14.0 | 50 |
| 25.1 | 45 |
| 34.9 | 40 |
| 50.5 | 30 |
| 61.8 | 20 |

147.—(*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| 70.3 | 10 |
| 76.7 | 0 |

148. (209)
B = $C_8H_8O_2$
*o*-Toluic acid

| A | |
|---|---|
| 57.3 | 100 |
| 49.9 | 90 |
| 45.5 | 85 |
| A + AB | |
| 37.7E | 77.8 |
| AB | |
| 41.1 | 75 |
| 46.0 | 70 |
| 49.3 | 65 |
| 51.3 | 60 |
| 52.5 | 55 |
| **53.0** | **50** |
| AB + B | |
| 52.9E | 49 |
| B | |
| 59.3 | 45 |
| 67.0 | 40 |
| 80.0 | 30 |
| 90.0 | 20 |
| 97.6 | 10 |
| 103.4 | 0 |

149. (209)
B = $C_8H_8O_2$
*m*-Toluic acid

| A | |
|---|---|
| 57.3 | 100 |
| 49.7 | 90 |
| 45.2 | 85 |
| 39.8 | 80 |
| 34.2 | 75 |
| 28.0 | 70 |
| A + AB | |
| 26.0E | 68.5 |
| AB | |
| 29.6 | 65 |
| 33.4 | 60 |
| 36.0 | 55 |
| AB + B | |
| 37.3U | 50.5 |
| B | |
| 55.0 | 45 |
| 65.9 | 40 |
| 80.9 | 30 |
| 91.7 | 20 |
| 100.7 | 10 |
| 107.6 | 0 |

150. (209)
B = $C_8H_8O_2$
*p*-Toluic acid

| A | |
|---|---|
| 57.3 | 100 |
| 49.3 | 90 |

150.—(*Continued*)

| °C | Mol % A |
|---|---|
| A + AB | |
| 42.0E | 83.5 |
| AB | |
| 48.3 | 80 |
| 54.9 | 75 |
| 59.9 | 70 |
| AB + B | |
| 64.5U | 64 |
| B | |
| 84.1 | 60 |
| 100.8 | 55 |
| 115.0 | 50 |
| 126.3 | 45 |
| 137.2 | 40 |
| 152.3 | 30 |
| 164.2 | 20 |
| 172.8 | 10 |
| 178.6 | 0 |

151. (212)
B = $C_8H_8O_2$
Methyl benzoate

| A | |
|---|---|
| 58.0 | 100 |
| 50.0 | 90 |
| 37.9 | 80 |
| 29.2 | 75 |
| 18.8 | 70 |
| + 7.0 | 65 |
| − 5.5 | 60 |
| A + AB | |
| −11.0E | 57.7 |
| AB | |
| **− 8.8** | **50** |
| −10.2 | 45 |
| −13.0 | 40 |
| −17.1 | 35 |
| −22.5 | 30 |
| AB + B | |
| −29.0E | 25 |
| B | |
| −24.2 | 20 |
| −20.2 | 15 |
| −16.7 | 10 |
| −14.1 | 5 |
| −12.3 | 0 |

152. (213)
B = $C_8H_8O_3$
Vanillin

| A | |
|---|---|
| 58.0 | 100 |
| 50.5 | 90 |
| 38.8 | 80 |
| 30.3 | 75 |
| 20.2 | 70 |
| A + $A_2B$ | |
| 14.2E | 67.3 |
| $A_2B$ | |
| **14.3** | **66.7** |
| $A_2B$ + AB | |
| 12.0E | 62 |
| AB | |
| 16.1 | 60 |
| 21.8 | 55 |

152.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB + $AB_2$ | |
| 22.8U | 51.2 |
| $AB_2$ | |
| 35.1 | 45 |
| 41.3 | 40 |
| $AB_2$ + B | |
| 44.7U | 35 |
| B | |
| 53.3 | 30 |
| 60.4 | 25 |
| 65.7 | 20 |
| 70.2 | 15 |
| 73.9 | 10 |
| 80.9 | 0 |

153. (212)
B = $C_8H_{14}O_4$
Diethyl succinate

| | |
|---|---|
| 58.0 | 100 |
| 46.8 | 90 |
| 24.0 | 80 |
| + 4.5 | 75 |
| −20.5 | 70 |
| −43.8 | 40 |
| −38.0 | 35 |
| −33.4 | 30 |
| −30.2 | 25 |
| −27.7 | 20 |
| −25.6 | 15 |
| −23.8 | 10 |
| −22.3 | 5 |
| −20.8 | 0 |

154. (209)
B = $C_9H_8O_2$
Cinnamic acid

| A | |
|---|---|
| 57.3 | 100 |
| 50.8 | 90 |
| 47.0 | 85 |
| 42.2 | 80 |
| A + AB | |
| 39.7E | 77.7 |
| AB | |
| 43.7 | 75 |
| 50.3 | 70 |
| 55.3 | 65 |
| 58.8 | 60 |
| AB + B | |
| 63.5U | 52 |
| B | |
| 67.9 | 50 |
| 77.2 | 45 |
| 85.8 | 40 |
| 100.7 | 30 |
| 113.7 | 20 |
| 125.8 | 10 |
| 136.8 | 0 |

155. (212)
B = $C_9H_{10}O_2$
Ethyl benzoate

| A | |
|---|---|
| 58.0 | 100 |
| 50.3 | 90 |
| 38.7 | 80 |

$C_2HCl_3O_2$.—(*Continued*)

155.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 30.0 | 75 |
| 19.6 | 70 |
| + 8.2 | 65 |
| − 8.2 | 60 |
| A + AB | |
| −24.5E | 56 |
| AB | |
| **−23.4** | **50** |
| −24.9 | 45 |
| −27.7 | 40 |
| −32.0 | 35 |
| −37.4 | 30 |
| AB + B | |
| −46.5E | 27.6 |
| B | |
| −43.2 | 25 |
| −44.3 | 20 |
| −40.5 | 15 |
| −37.1 | 10 |
| −34.6 | 5 |
| −32.7 | 0 |

156. (212)

$B = C_9H_{10}O_2$

Methyl *p*-toluate

| A | |
|---|---|
| 58.0 | 100 |
| 50.6 | 90 |
| 38.5 | 80 |
| 30.8 | 75 |
| 20.5 | 70 |
| 8.0 | 65 |
| A + AB | |
| 3.0E | 63 |
| AB | |
| 8.2 | 55 |
| **9.0** | **50** |
| 7.5 | 45 |
| AB + B | |
| 3.5E | 39 |
| B | |
| 9.0 | 35 |
| 15.4 | 30 |
| 20.6 | 25 |
| 24.7 | 20 |
| 27.8 | 15 |
| 30.2 | 10 |
| 31.9 | 5 |
| 33.2 | 0 |

157. (212)

$B = C_9H_{10}O_3$

Methyl anisate

| A | |
|---|---|
| 58.0 | 100 |
| 49.7 | 90 |
| 35.5 | 80 |
| 26.3 | 75 |
| 15.8 | 70 |
| + 3.4 | 65 |
| A + AB | |
| −10.0E | 60 |

157.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB | |
| − 7.1 | 55 |
| **− 6.3** | **50** |
| AB + B | |
| − 8.0E | 44.5 |
| B | |
| + 5.0 | 40 |
| 16.0 | 35 |
| 23.8 | 30 |
| 29.9 | 25 |
| 35.0 | 20 |
| 39.3 | 15 |
| 42.8 | 10 |
| 45.8 | 5 |
| 48.3 | 0 |

158. (210)

$B = C_{10}H_8O$

α-Naphthol

| A | |
|---|---|
| 58.0 | 100 |
| 51.8 | 90 |
| 45.0 | 80 |
| A + B | |
| 41.0E | 76 |
| B | |
| 45.9 | 70 |
| 50.3 | 65 |
| 54.4 | 60 |
| 58.2 | 55 |
| 61.8 | 50 |
| 65.3 | 45 |
| 69.0 | 40 |
| 72.4 | 35 |
| 75.8 | 30 |
| 79.3 | 25 |
| 82.6 | 20 |
| 85.7 | 15 |
| 88.6 | 10 |
| 91.3 | 5 |
| 94.2 | 0 |

159. (210)

$B = C_{10}H_8O$

β-Naphthol

| A | |
|---|---|
| 58.0 | 100 |
| 50.4 | 90 |
| A + B | |
| 41.3E | 79 |
| B | |
| 48.0 | 75 |
| 56.5 | 70 |
| 64.2 | 65 |
| 70.6 | 60 |
| 77.0 | 55 |
| 82.3 | 50 |
| 87.6 | 45 |
| 91.9 | 40 |
| 97.0 | 35 |
| 101.1 | 30 |
| 105.2 | 25 |
| 109.2 | 20 |

159.—(*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| 112.8 | 15 |
| 116.3 | 10 |
| 119.8 | 5 |
| 123.0 | 0 |

160. (212)

$B = C_{10}H_{10}O_2$

Methyl cinnamate

| A | |
|---|---|
| 58.0 | 100 |
| 49.7 | 90 |
| 38.1 | 80 |
| 29.8 | 75 |
| 20.0 | 70 |
| 7.1 | 65 |
| A + AB | |
| 1.0E | 63 |
| AB | |
| 3.6 | 60 |
| 6.9 | 55 |
| **8.5** | **50** |
| 7.0 | 45 |
| AB + B | |
| 1.0E | 38 |
| B | |
| 6.0 | 35 |
| 13.7 | 30 |
| 19.1 | 25 |
| 23.5 | 20 |
| 27.2 | 15 |
| 30.2 | 10 |
| 32.5 | 5 |
| 34.7 | 0 |

161. (212)

$B = C_{10}H_{10}O_4$

Dimethyl terephthalate

| A | |
|---|---|
| 58.0 | 100 |
| 48.2 | 90 |
| A + $A_4B$ | |
| 27.9U | 80 |
| $A_4B$ | |
| 26.6 | 75 |
| $A_4B$ + B | |
| 25.0E | 72.2 |
| B | |
| 33.8 | 70 |
| 51.5 | 65 |
| 68.4 | 60 |
| 82.6 | 55 |
| 93.4 | 50 |
| 102.0 | 45 |
| 109.2 | 40 |
| 115.3 | 35 |
| 120.6 | 30 |
| 125.2 | 25 |
| 129.3 | 20 |
| 132.8 | 15 |
| 135.8 | 10 |
| 138.2 | 5 |
| 140.3 | 0 |

162. (210)

$B = C_{10}H_{14}O$

Thymol

| °C | Mol % A |
|---|---|
| A | |
| 58.0 | 100 |
| 51.2 | 90 |
| 42.8 | 80 |
| 38.2 | 75 |
| 33.0 | 70 |
| 27.3 | 65 |
| 21.1 | 60 |
| 14.8 | 55 |
| A + B | |
| 9.0E | 50.5 |
| B | |
| 15.6 | 45 |
| 21.1 | 40 |
| 26.8 | 35 |
| 30.8 | 30 |
| 34.9 | 25 |
| 38.6 | 20 |
| 41.7 | 15 |
| 44.4 | 10 |
| 47.1 | 5 |
| 49.6 | 0 |

163. (212)

$B = C_{12}H_{10}O_2$

α-Naphthyl acetate

| A | |
|---|---|
| 58.0 | 100 |
| 50.4 | 90 |
| 39.0 | 80 |
| 30.6 | 75 |
| 20.9 | 70 |
| A + AB | |
| 5.5E | 63.5 |
| AB | |
| 7.7 | 60 |
| 9.9 | 55 |
| **10.7** | **50** |
| 9.8 | 45 |
| AB + B | |
| 7.8E | 41.5 |
| B | |
| 17.8 | 35 |
| 24.0 | 30 |
| 28.4 | 25 |
| 32.9 | 20 |
| 36.8 | 15 |
| 39.8 | 10 |
| 42.4 | 5 |
| 44.8 | 0 |

164. (212)

$B = C_{12}H_{10}O_2$

β-Naphthyl acetate

| A | |
|---|---|
| 58.0 | 100 |
| 50.5 | 90 |
| A + AB | |
| 39.2E | 80 |
| AB | |
| 47.9 | 75 |
| 55.6 | 70 |

164.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB | |
| 60.1 | 65 |
| 63.4 | 60 |
| 65.4 | 55 |
| **66.3** | **50** |
| 65.6 | 45 |
| 63.7 | 40 |
| 60.8 | 35 |
| 56.8 | 30 |
| AB + B | |
| 53.5E | 26.5 |
| B | |
| 57.9 | 20 |
| 61.0 | 15 |
| 64.0 | 10 |
| 66.5 | 5 |
| 68.5 | 0 |

165. (213)

$B = C_{13}H_{10}O$

Benzophenone

| A | |
|---|---|
| 58.0 | 100 |
| 50.2 | 90 |
| 38.2 | 80 |
| 29.8 | 75 |
| 19.3 | 70 |
| +7.0 | 65 |
| −6.0 | 60 |
| vis. | 60–43 |
| −3.1 | 42.5 |
| +2.6 | 40 |
| 12.4 | 35 |
| 20.5 | 30 |
| 27.3 | 25 |
| 32.7 | 20 |
| 37.2 | 15 |
| 40.8 | 10 |
| 46.3 | 0 |

166. (212)

$B = C_{13}H_{10}O_2$

Phenyl benzoate

| A | |
|---|---|
| 58.0 | 100 |
| 50.0 | 90 |
| 38.5 | 80 |
| 31.0 | 75 |
| 22.0 | 70 |
| 11.4 | 65 |
| A + B | |
| 7.0E | 63 |
| B | |
| 12.2 | 60 |
| 20.8 | 55 |
| 29.0 | 50 |
| 36.0 | 45 |
| 41.9 | 40 |
| 47.0 | 35 |
| 51.2 | 30 |
| 54.9 | 25 |
| 58.2 | 20 |
| 61.4 | 15 |
| 64.2 | 10 |
| 66.3 | 5 |
| 67.8 | 0 |

167. (212)

$B = C_{13}H_{13}O_3$

Phenyl salicylate

| °C | Mol % A |
|---|---|
| 58.0 | 100 |
| 50.0 | 90 |
| 39.2 | 80 |
| 7.5 | 50 |
| 12.4 | 45 |
| 17.2 | 40 |
| 21.6 | 35 |
| 25.5 | 30 |
| 27.9 | 25 |
| 32.2 | 20 |
| 34.9 | 15 |
| 37.5 | 10 |
| 39.9 | 5 |
| 41.9 | 0 |

168. (213)

$B = C_{14}H_{10}O_2$

Benzil

| A | |
|---|---|
| 58.0 | 100 |
| 49.7 | 90 |
| 37.2 | 80 |
| 30.3 | 75 |
| A + B | |
| 18.0E | 68 |
| B | |
| 24.7 | 65 |
| 34.9 | 60 |
| 43.9 | 55 |
| 51.8 | 50 |
| 58.6 | 45 |
| 64.8 | 40 |
| 69.8 | 35 |
| 74.2 | 30 |
| 78.2 | 25 |
| 81.8 | 20 |
| 85.2 | 15 |
| 88.3 | 10 |
| 94.0 | 0 |

169. (213)

$B = C_{14}H_{12}O_2$

Phenyl anisyl ketone

| 58.0 | 100 |
|---|---|
| 48.3 | 90 |
| 34.0 | 80 |
| 23.3 | 75 |
| +10.4 | 70 |
| − 4.0 | 65 |
| vis. | 65–48 |
| + 1.4 | 47.5 |
| 8.7 | 45 |
| 21.3 | 40 |
| 31.8 | 35 |
| 39.2 | 30 |
| 44.2 | 25 |
| 48.5 | 20 |
| 51.8 | 15 |
| 54.3 | 10 |
| 58.7 | 0 |

170. (212)
B = $C_{14}H_{12}O_2$
Benzyl benzoate

| °C | Mol % A |
|---|---|
| A | |
| 58.0 | 100 |
| 49.6 | 90 |
| 38.0 | 80 |
| 30.6 | 75 |
| 21.5 | 70 |
| A + AB | |
| 8.5E | 64 |
| AB | |
| 10.2 | 60 |
| 11.4 | 55 |
| **11.9** | **50** |
| 10.7 | 45 |
| 8.4 | 40 |
| 4.3 | 35 |
| AB + B | |
| 1.0E | 32 |
| B | |
| 6.8 | 25 |
| 10.0 | 20 |
| 12.8 | 15 |
| 15.0 | 10 |
| 16.7 | 5 |
| 18.3 | 0 |

171. (213)
B = $C_{17}H_{14}O$
Dibenzalacetone

| | |
|---|---|
| A | |
| 58.0 | 100 |
| A + $A_2B$ | |
| 45.0E | 90.5 |
| $A_2B$ | |
| 77.2 | 80 |
| 82.8 | 75 |
| (87.6 | 75) |
| 85.7 | 70 |
| (99.9 | 70) |
| AB | |
| 107.9 | 65 |
| 112.7 | 60 |
| 115.6 | 55 |
| **117.0** | **50** |
| 115.0 | 45 |
| 111.8 | 40 |

## $C_2H_2$
Acetylene
172. (25)
B = $C_2H_6O$
Methyl ether

| | |
|---|---|
| A | |
| − 81.5 | 100 |
| A + AB | |
| −121.0E | 64.5 |
| AB | |
| **−117.4** | **50** |
| AB + B | |
| −152E | 19 |
| B | |
| −138 | 0 |

## $C_2H_2Br_3NO$
Tribromoacetamide
173. (288)
B = $C_2H_2Cl_3NO$
Trichloroacetamide

| °C | Mol % A |
|---|---|
| A | |
| 120.55 | 100 |
| Mix | |
| (?) | (?) |
| B | |
| 139.91 | 0 |

## $C_2H_2Cl_2O_2$
Dichloroacetic acid
174. (209)
B = $C_2H_3ClO_2$
Chloroacetic acid

| | |
|---|---|
| A | |
| 9.7 | 100 |
| 7.2 | 95 |
| 4.2 | 90 |
| + 0.9 | 85 |
| − 2.4 | 80 |
| − 6.1 | 75 |
| A + B | |
| −10.5E | 69.3 |
| B | |
| + 9.8 | 60 |
| 24.5 | 50 |
| 35.2 | 40 |
| 43.8 | 30 |
| 50.8 | 20 |
| 56.6 | 10 |
| 61.4 | 0 |

175. (209)
B = $C_2H_4O_2$
Acetic acid

| | |
|---|---|
| 9.7 | 100 |
| 6.5 | 95 |
| + 2.8 | 90 |
| − 1.6 | 85 |
| − 6.2 | 80 |
| −12.1 | 75 |
| −18.7 | 70 |
| −34.7 | 60 |
| B | |
| −27.8 | 40 |
| −11.6 | 30 |
| + 0.3 | 20 |
| 9.3 | 10 |
| 16.4 | 0 |

176. (209)
B = $C_4H_6O_2$
Crotonic acid

| | |
|---|---|
| A | |
| 9.7 | 100 |
| 5.7 | 95 |
| + 1.7 | 90 |
| − 2.7 | 85 |
| − 7.0 | 80 |
| −11.9 | 75 |
| A + B | |
| −19.0E | 68 |

176.—(*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| −11.0 | 60 |
| +10.1 | 50 |
| 26.7 | 40 |
| 40.0 | 30 |
| 51.9 | 20 |
| 62.3 | 10 |
| 71.0 | 0 |

177. (209)
B = $C_7H_6O_2$
Benzoic acid

| | |
|---|---|
| A | |
| 9.7 | 100 |
| A + AB | |
| 7.4E | 96.4 |
| AB | |
| 13.5 | 95 |
| 30.0 | 90 |
| 40.1 | 85 |
| 46.0 | 80 |
| 50.0 | 75 |
| 53.0 | 70 |
| 57.2 | 60 |
| AB + B | |
| 58.0U | 53.6 |
| B | |
| 63.4 | 50 |
| 77.8 | 40 |
| 90.7 | 30 |
| 102.3 | 20 |
| 112.2 | 10 |
| 121.0 | 0 |

178. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| | |
|---|---|
| A | |
| 9.7 | 100 |
| + 4.8 | 95 |
| − 1.9 | 90 |
| −11.0 | 85 |
| −23.8 | 80 |
| (?) | 75 |
| (?) | 70 |
| AB | |
| − 4.5 | 65 |
| +10.5 | 60 |
| 19.5 | 55 |
| 22.9 | 50 |
| AB + B | |
| 22.8E | 49 |
| B | |
| 48.2 | 45 |
| 73.0 | 40 |
| 89.9 | 35 |
| 101.0 | 30 |
| 110.2 | 25 |
| 117.8 | 20 |
| 123.1 | 15 |
| 126.8 | 10 |
| 132.1 | 0 |

179. (209)
B = $C_8H_8O_2$
Phenylacetic acid

179.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 9.7 | 100 |
| 5.6 | 95 |
| + 1.3 | 90 |
| − 3.1 | 85 |
| − 7.9 | 80 |
| −13.4 | 75 |
| A + B | |
| −21.0E | 68.7 |
| B | |
| + 1.7 | 60 |
| 22.5 | 50 |
| 38.6 | 40 |
| 51.6 | 30 |
| 61.9 | 20 |
| 69.9 | 10 |
| 76.6 | 0 |

180. (209)
B = $C_8H_8O_2$
*o*-Toluic acid

| | |
|---|---|
| A | |
| 9.7 | 100 |
| 5.6 | 95 |
| + 1.3 | 90 |
| A + B | |
| − 2.0E | 86 |
| B | |
| +12.1 | 80 |
| 22.4 | 75 |
| 31.6 | 70 |
| 47.8 | 60 |
| 61.6 | 50 |
| 73.1 | 40 |
| 82.5 | 30 |
| 90.4 | 20 |
| 97.3 | 10 |
| 103.4 | 0 |

181. (209)
B = $C_8H_8O_2$
*m*-Toluic acid

| | |
|---|---|
| A | |
| 9.7 | 100 |
| 5.3 | 95 |
| + 0.7 | 90 |
| − 4.2 | 85 |
| A + B | |
| − 8.0E | 81 |
| B | |
| +11.7 | 75 |
| 23.8 | 70 |
| 43.2 | 60 |
| 59.3 | 50 |
| 72.6 | 40 |
| 83.3 | 30 |
| 92.6 | 20 |
| 100.5 | 10 |
| 107.6 | 0 |

182. (209)
B = $C_8H_8O_2$
*p*-Toluic acid

| | |
|---|---|
| A | |
| 9.7 | 100 |
| 5.2 | 95 |

182.—(*Continued*)

| °C | Mol % A |
|---|---|
| A + B | |
| 3.5E | 93 |
| B | |
| 18.8 | 90 |
| 40.2 | 85 |
| 58.3 | 80 |
| 72.3 | 75 |
| 84.6 | 70 |
| 107.0 | 60 |
| 125.2 | 50 |
| 140.3 | 40 |
| 153.0 | 30 |
| 163.5 | 20 |
| 171.8 | 10 |
| 178.6 | 0 |

183. (209)
B = $C_9H_8O_2$
Cinnamic acid

| | |
|---|---|
| A | |
| 9.7 | 100 |
| A + AB | |
| 8.0E | 97.7 |
| AB | |
| 30.2 | 95 |
| 48.7 | 90 |
| 57.8 | 85 |
| 64.9 | 80 |
| 70.0 | 75 |
| 74.2 | 70 |
| 78.7 | 60 |
| **80.1** | **50** |
| AB + B | |
| 80E | 49 |
| B | |
| 93.5 | 40 |
| 106.2 | 30 |
| 117.8 | 20 |
| 128.1 | 10 |
| 136.8 | 0 |

*v. also* 115

## $C_2H_2Cl_3NO$
Trichloroacetamide
*v.* 173

## $C_2H_2Cl_4$
Tetrachloroethane
184. (475)
B = $C_{12}H_9N$
Carbazole

| °C | g B per 100 g A |
|---|---|
| 20.0 | 0.65 |
| 30.0 | 0.92 |
| 40.0 | 1.25 |
| 50.0 | 1.62 |
| 60.0 | 2.12 |
| 70.0 | 2.80 |
| 80.0 | 3.6 |
| 100.0 | 6.2 |
| 120.0 | 11.1 |
| 140.0 | 17.1 |

185. *v.* p. 173
B = $C_{14}H_8O_2$
Anthraquinone

186. *v.* p. 173
B = $C_{14}H_{10}$
Anthracene

187. *v.* p. 173
B = $C_{14}H_{10}$
Phenanthrene

## $C_2H_2I_2$
*cis*-Acetylene diiodide
188. (76)
B = $C_2H_2I_2$
*trans*-Acetylene diiodide

| °C | Mol % A |
|---|---|
| −13.8 | 100 |
| +10 | 84.5 |
| 33U? | 60 |
| 61.5 | 50 |
| 72.0 | 0 |

## $C_2H_3ClO_2$
α-Chloroacetic acid
189. *v.* p. 173
B = $C_2H_4O_2$
Acetic acid

190. *v.* p. 173
B = $C_4H_6O_2$
Crotonic acid

191. (212)
B = $C_4H_6O_4$
Dimethyl oxalate

| °C | Mol % A |
|---|---|
| A | |
| 61.7 | 100 |
| 56.2 | 90 |
| 49.5 | 80 |
| 41.7 | 70 |
| 32.8 | 60 |
| A + B | |
| 25.5E | 52.5 |
| B | |
| 34.6 | 40 |
| 40.4 | 30 |
| 45.4 | 20 |
| 49.6 | 10 |
| 53.2 | 0 |

192. (212)
B = $C_6H_6$

| | |
|---|---|
| A | |
| 61.7 | 100 |
| 57.7 | 90 |
| 53.7 | 80 |
| 50.0 | 70 |
| 46.5 | 60 |
| 42.9 | 50 |
| 39.2 | 40 |
| 34.7 | 30 |
| 27.9 | 20 |
| 14.1 | 10 |
| A + B | |
| 3.5E | 5 |
| B | |
| 5.4 | 0 |

$C_2H_3ClO_2$.—(*Continued*)

193. *v.* p. 173
B = $C_6H_6O$
Phenol

194. (212)
B = $C_6H_{10}O_4$
Dimethyl succinate

| °C | Mol % A |
|---|---|
| A | |
| 61.7 | 100 |
| 54.7 | 90 |
| 45.3 | 80 |
| 34.2 | 70 |
| 21.3 | 60 |
| +7.2 | 50 |
| A + B | |
| −3.5E | 42.8 |
| B | |
| −1.5 | 40 |
| +5.5 | 30 |
| 10.5 | 20 |
| 14.7 | 10 |
| 18.2 | 0 |

195. *v.* p. 173
B = $C_7H_6O_2$
Benzoic acid

196. *v.* p. 173
B = $C_7H_8O$
*o*-Cresol

197. *v.* p. 173
*m*-Cresol

198. *v.* p. 173
*p*-Cresol

199. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| | |
|---|---|
| A | |
| 61.3 | 100 |
| 57.8 | 95 |
| 53.3 | 90 |
| 46.3 | 85 |
| 35.6 | 80 |
| 22.0 | 75 |
| A + AB | |
| 5.1E | 70 |
| AB | |
| 22.0 | 65 |
| 32.0 | 60 |
| 37.7 | 55 |
| **39.9** | **50** |
| AB + B | |
| 39.9E | 49.5 |
| B | |
| 62.3 | 45 |
| 79.9 | 40 |
| 92.7 | 35 |
| 102.7 | 30 |
| 110.2 | 25 |
| 116.7 | 20 |
| 121.7 | 15 |
| 125.8 | 10 |
| 132.1 | 0 |

200. (313)
B = $C_7H_8O_2$
Guaiacol

| °C | Mol % A |
|---|---|
| A | |
| 61.7 | 100 |
| 56.1 | 90 |
| 50.0 | 80 |
| 43.6 | 70 |
| 37.0 | 60 |
| 30.1 | 50 |
| 22.8 | 40 |
| A + B | |
| 13.0E | 26.6 |
| B | |
| 17.8 | 20 |
| 24.9 | 10 |
| 32.0 | 0 |

201. (213, 315)
B = $C_8H_6O_3$
Piperonal

| | |
|---|---|
| A | |
| 61.86 | 100 |
| 55.5 | 90 |
| 48.5 | 80 |
| 39.9 | 70 |
| 29.8 | 60 |
| 18.4 | 50 |
| A + B | |
| 7.3E | 40.5 |
| B | |
| 15.5 | 30 |
| 23.0 | 20 |
| 29.8 | 10 |
| 35.5 | 0 |

202. (213)
B = $C_8H_8O$
Acetophenone

| | |
|---|---|
| 61.7 | 100 |
| 54.8 | 90 |
| 46.0 | 80 |
| 36.2 | 70 |
| 23.4 | 60 |
| +7.8 | 50 |
| A + B | |
| −7.3E | 41 |
| B | |
| +0.6 | 30 |
| 7.4 | 20 |
| 13.5 | 10 |
| 18.7 | 0 |

203. *v.* p. 173
B = $C_8H_8O_2$
Phenylacetic acid

204. *v.* p. 173
B = $C_8H_8O_2$
*o*-Toluic acid

205. *v.* p. 173
B = $C_8H_8O_2$
*m*-Toluic acid

206. *v.* p. 173
B = $C_8H_8O_2$
*p*-Toluic acid

207. (213)
B = $C_8H_8O_3$
Vanillin

| °C | Mol % A |
|---|---|
| A | |
| 61.7 | 100 |
| 55.4 | 90 |
| 48.3 | 80 |
| 40.7 | 70 |
| A + B | |
| 30.5E | 57.4 |
| B | |
| 41.5 | 50 |
| 52.9 | 40 |
| 61.8 | 30 |
| 69.2 | 20 |
| 75.4 | 10 |
| 80.9 | 0 |

208. *v.* p. 173
B = $C_9H_8O_2$
Cinnamic acid

209. (315)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % A |
|---|---|
| A | |
| 61.7 | 100 |
| 57.0 | 90 |
| 53.2 | 80 |
| A + B | |
| 52.7E | 75 |
| B | |
| 56.2 | 70 |
| 61.3 | 60 |
| 64.7 | 50 |
| 67.7 | 40 |
| 70.6 | 30 |
| 73.5 | 20 |
| 76.4 | 10 |
| 79.6 | 0 |

210. (313)
B = $C_{10}H_8O$
α-Naphthol

| | |
|---|---|
| A | |
| 61.7 | 100 |
| 56.9 | 90 |
| 51.2 | 80 |
| A + B | |
| 47.0E | 73 |
| B | |
| 57.0 | 60 |
| 64.7 | 50 |
| 71.6 | 40 |
| 77.8 | 30 |
| 83.5 | 20 |
| 89.0 | 10 |
| 94.0 | 0 |

211. (313)
B = $C_{10}H_8O$
β-Naphthol

| | |
|---|---|
| A | |
| 61.7 | 100 |
| 55.0 | 90 |

211.—(*Continued*)

| °C | Mol % A |
|---|---|
| A + B | |
| 48.0E | 80 |
| B | |
| 62.5 | 70 |
| 74.8 | 60 |
| 86.0 | 50 |
| 95.7 | 40 |
| 103.5 | 30 |
| 110.5 | 20 |
| 116.5 | 10 |
| 122.0 | 0 |

212. (212)
B = $C_{10}H_{10}O_2$
Methyl cinnamate

| | |
|---|---|
| A | |
| 61.7 | 100 |
| 55.5 | 90 |
| 47.8 | 80 |
| 39.5 | 70 |
| 30.5 | 60 |
| 20.9 | 50 |
| A + B | |
| 11.4E | 40.7 |
| B | |
| 18.6 | 30 |
| 24.8 | 20 |
| 30.1 | 10 |
| 34.4 | 0 |

213. (313)
B = $C_{10}H_{14}O$
Thymol

| | |
|---|---|
| A | |
| 61.7 | 100 |
| 57.2 | 90 |
| 52.9 | 80 |
| 48.5 | 70 |
| 43.5 | 60 |
| 37.9 | 50 |
| A + B | |
| 30.1E | 39 |
| B | |
| 36.0 | 30 |
| 41.5 | 20 |
| 46.0 | 10 |
| 50.0 | 0 |

214. (379)
B = $C_{10}H_{16}O$
Camphor

| | |
|---|---|
| A | |
| 63 | 100 |
| 46.2 | 96.71 |
| 41 | 88.12 |
| 33 | 81.01 |
| 23.1 | 70.57 |
| B | |
| 40 | 34.87 |
| 75 | 28.63 |
| 106 | 22.03 |
| 175 | 0.00 |

215. *v.* p. 173
B = $C_{13}H_{10}O_3$
Salol

216. (213)
B = $C_{14}H_{10}O_2$
Benzil

| °C | Mol % A |
|---|---|
| A | |
| 61.7 | 100 |
| 56.6 | 90 |
| A + B | |
| 50.0E | 77.5 |
| B | |
| 56.1 | 70 |
| 63.8 | 60 |
| 70.2 | 50 |
| 75.9 | 40 |
| 80.9 | 30 |
| 85.6 | 20 |
| 89.9 | 10 |
| 94.0 | 0 |

217. (315)
B = $C_{16}H_{34}O$
Cetyl alcohol

| | |
|---|---|
| A | |
| 61.7 | 100 |
| 56.6 | 90 |
| 51.5 | 80 |
| 45.3 | 70 |
| 35.4 | 60 |
| A + B | |
| 26.0E | 53.5 |
| B | |
| 31.5 | 40 |
| 36.4 | 30 |
| 40.8 | 20 |
| 44.5 | 10 |
| 47.7 | 0 |

218. (213)
B = $C_{17}H_{14}O$
Dibenzalacetone

| | |
|---|---|
| A | |
| 61.7 | 100 |
| 54.1 | 90 |
| 44.3 | 80 |
| A + B | |
| 32.2E | 68.6 |
| B | |
| 55.1 | 60 |
| 72.7 | 50 |

$C_2H_3ClO_2$
β-Chloroacetic acid

219. (315)
B = $C_2H_4O_2$
Acetic acid

| | |
|---|---|
| A | |
| 56.68 | 100 |
| 51.0 | 90 |
| 44.5 | 80 |
| 36.9 | 70 |
| 27.4 | 60 |
| 17.0 | 50 |
| +4.0 | 40 |
| A + B | |
| −8.0E | 31.5 |
| B | |
| +2.0 | 20 |
| 10.0 | 10 |
| 16.67 | 0 |

220. *v.* p. 173
B = $C_6H_6O$
Phenol

221. *v.* p. 173
B = $C_7H_8O$
*o*-Cresol

222. *v.* p. 173
*m*-Cresol

223. *v.* p. 173
*p*-Cresol

224. (313)
B = $C_7H_8O_2$
Guaiacol

| °C | Mol % A |
|---|---|
| A | |
| 56.6 | 100 |
| 51.0 | 90 |
| 45.0 | 80 |
| 38.5 | 70 |
| 32.0 | 60 |
| 25.0 | 50 |
| 17.8 | 40 |
| A + B | |
| 10.6E | 30 |
| B | |
| 17.8 | 20 |
| 24.9 | 10 |
| 32.0 | 0 |

225. (315)
B = $C_8H_6O_3$
Piperonal

| | |
|---|---|
| A | |
| 56.53 | 100 |
| 50.0 | 90 |
| 42.5 | 80 |
| 33.2 | 70 |
| 22.5 | 60 |
| 11.0 | 50 |
| A + B | |
| *ca.* 4.5E | 44 |
| B | |
| 7.7 | 40 |
| 15.5 | 30 |
| 23.0 | 20 |
| 29.8 | 10 |
| 35.5 | 0 |

226. (315)
B = $C_{10}H_8$
Naphthalene

| | |
|---|---|
| A | |
| 56.53 | 100 |
| 52.1 | 90 |
| A + B | |
| 48.5E | 80 |
| B | |
| 56.2 | 70 |
| 61.3 | 60 |
| 64.7 | 50 |
| 67.7 | 40 |
| 70.6 | 30 |
| 73.5 | 20 |
| 76.4 | 10 |
| 79.6 | 0 |

227. (313)
B = $C_{10}H_8O$
α-Naphthol

| °C | Mol % A |
|---|---|
| A | |
| 56.6 | 100 |
| 51.4 | 90 |
| A + B | |
| 44.0E | 76.5 |
| B | |
| 49.3 | 70 |
| 57.0 | 60 |
| 64.7 | 50 |
| 71.6 | 40 |
| 77.8 | 30 |
| 83.5 | 20 |
| 89.0 | 10 |
| 94.0 | 0 |

228. (313)
B = $C_{10}H_8O$
β-Naphthol

| | |
|---|---|
| A | |
| 56.6 | 100 |
| 49.6 | 90 |
| A + B | |
| 44.0E | 82.5 |
| B | |
| 62.5 | 70 |
| 74.8 | 60 |
| 86.0 | 50 |
| 95.7 | 40 |
| 103.5 | 30 |
| 110.5 | 20 |
| 116.5 | 10 |
| 122.0 | 0 |

229. (313)
B = $C_{10}H_{14}O$
Thymol

| | |
|---|---|
| A | |
| 56.6 | 100 |
| 52.3 | 90 |
| 48.1 | 80 |
| 43.7 | 70 |
| 38.7 | 60 |
| 32.9 | 50 |
| A + B | |
| 27.5E | 43 |
| B | |
| 36.0 | 30 |
| 41.5 | 20 |
| 46.0 | 10 |
| 50.0 | 0 |

230. *v.* p. 173
B = $C_{13}H_{10}O_3$
Salol

231. (315)
B = $C_{16}H_{34}O$
Cetyl alcohol

| | |
|---|---|
| A | |
| 55.7 | 100 |
| 51.7 | 90 |
| 46.0 | 80 |
| 36.0 | 70 |

231.—(*Continued*)

| °C | Mol % A |
|---|---|
| A + B | |
| 24.3E | 61 |
| B | |
| 27.3 | 50 |
| 31.5 | 40 |
| 36.4 | 30 |
| 40.8 | 20 |
| 44.5 | 10 |
| 47.7 | 0 |

*v. also* 116, 174

$C_2H_3Cl_3O_2$
Chloral hydrate
232. (436)
B = $C_2H_6O$
Ethyl alcohol

| | |
|---|---|
| 51.5 | 100 |
| 42.5 | 90 |
| 35.0 | 80 |
| 29.0 | 70 |
| 24.5 | 60 |
| 20.0 | 50 |
| 12.0 | 40 |
| 2.0 | 35 |

233. (436)
B = $C_7H_8$

| | |
|---|---|
| 51.5 | 100 |
| 45.0 | 90 |
| 40.0 | 80 |
| 36.5 | 70 |
| 35.0 | 60 |
| 33.5 | 50 |
| 31.5 | 40 |
| 29.0 | 30 |
| 25.7 | 20 |
| 19.0 | 10 |
| 11.5 | 5 |

234. (379)
B = $C_{10}H_{20}O$
Menthol

| | |
|---|---|
| A | |
| 56.5 | 100 |
| 49.9 | 89.45 |
| 42.6 | 79.05 |
| B | |
| 36.3 | 4.71 |
| 43.0 | 0 |

235. (456)
B = $C_{11}H_{12}N_2O$
Antipyrine

| | |
|---|---|
| A | |
| 51.5 | 100 |
| 35.5 | 90 |
| A + $A_2B$ | |
| 33.8E | 85 |
| $A_2B$ | |
| 44.5 | 80 |
| 59.5 | 70 |
| **61.8** | **66** |
| $A_2B$ + AB | |
| 56E | 56 |
| AB | |
| **62.3** | **50** |

235.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB + B | |
| 50.5E | 39 |
| B | |
| 68.8 | 30 |
| 84.2 | 20 |
| 96.8 | 10 |
| 102.8 | 5 |
| 108.9 | 0 |

236. (34)
B = $C_{13}H_{10}O_3$
Salol

| | |
|---|---|
| A | |
| 51.5 | 100 |
| 35.2 | 90 |
| 39.0 | 80 |
| 32.7 | 70 |
| 26.4 | 60 |
| 20.1 | 50 |
| A + B | |
| 16.0E | 43.5 |
| B | |
| 25.3 | 30 |
| 30.9 | 20 |
| 36.2 | 10 |
| 39.1 | 5 |
| 42.0 | 0 |

*v. also* 37

$C_2H_3NS$
Methyl isothiocyanate
237. (281)
B = $C_{10}H_8$
Naphthalene

| | |
|---|---|
| A | |
| 34 | 100 |
| A + B | |
| 40E | 65.8 |
| B | |
| 80 | 0 |

238. (281)
B = $C_{10}H_{16}$
Camphene

| | |
|---|---|
| A | |
| 34.0 | 100 |
| A + B | |
| −7.5E | 28.35 |
| B | |
| 49.3 | 0 |

239. (100)
B = $C_{10}H_{16}O$
Camphor

| | |
|---|---|
| A | |
| 34.0 | 100 |
| A + B | |
| −34.2E | 50 |
| ? | |
| 97U *ca.* | 15 |
| B | |
| 178 | 0 |

$C_2H_4$
Ethylene
240. (25)
B = $C_2H_6O$
Methyl ether

| °C | Mol % A |
|---|---|
| A | |
| −169.5 | 100 |
| A + AB | |
| −178.5E | 78.5 |
| AB + B | |
| −163.2U | 50 |
| B | |
| −138.0 | 0 |

$C_2H_4Br_2$
Ethylene dibromide
241. (18, 86)
B = $C_2H_4O_2$
Acetic acid

| | |
|---|---|
| A | |
| 9.7 | 100 |
| 6.8 | 90 |
| 4.1 | 80 |
| +1.3 | 70 |
| −1.2 | 60 |
| A + B | |
| −2.76E | 52.9 |
| B | |
| +0.4 | 40 |
| 3.4 | 30 |
| 8.1 | 20 |
| 11.5 | 10 |
| 15.7 | 0 |

242. (86)
B = $C_6H_5NO_2$
Nitrobenzene

| | |
|---|---|
| A | |
| 9.7 | 100 |
| + 3.8 | 90 |
| − 1.5 | 80 |
| − 7.2 | 70 |
| −13.6 | 60 |
| A + B | |
| −21.46E | 48 |
| B | |
| −16.0 | 40 |
| −10.8 | 30 |
| − 5.4 | 20 |
| + 0.2 | 10 |
| 5.54 | 0 |

243. (428)
B = $C_6H_5NO_3$
*o*-Nitrophenol

| °C | Wt. % A |
|---|---|
| 44.9 | 0 |
| 42.3 | 5 |
| 39.7 | 10 |
| 35.3 | 20 |
| 31.3 | 30 |
| 26.6 | 40 |
| 21.2 | 50 |
| 15.0 | 60 |

244. (428)
B = $C_6H_5NO_2$
*p*-Nitrophenol

| °C | Wt. % A |
|---|---|
| 114.0 | 0 |
| 106.7 | 5 |
| 101.5 | 10 |
| 94.0 | 20 |
| 88.3 | 30 |
| 83.5 | 40 |
| 79.1 | 50 |
| 74.5 | 60 |
| 69.5 | 70 |

245. *v.* p. 173
B = $C_6H_6$

246. (86, 375)
B = $C_6H_6O$
Phenol

| °C | Mol % A |
|---|---|
| A | |
| 10.0 | 100 |
| 5.75 | 90 |
| +2.6 | 80 |
| 0.9 | 70 |
| A + B | |
| −1.0E | 65 |
| B | |
| +0.8 | 60 |
| 6.5 | 50 |
| 12.8 | 40 |
| 19.6 | 30 |
| 26.3 | 20 |
| 33.2 | 10 |
| 40.24 | 0 |

247. (17)
B = $C_6H_{12}$
Cyclohexane

| | |
|---|---|
| A | |
| 9.7 | 100 |
| 4.7 | 90 |
| + 0.6 | 80 |
| − 2.4 | 70 |
| − 5.0 | 60 |
| − 7.9 | 50 |
| −11.3 | 40 |
| −15.3 | 30 |
| A + B | |
| −25.0E | 16.4 |
| B | |
| −13.3 | 10 |
| + 6.3 | 0 |

248. *v.* p. 173
B = $C_6H_{12}O_3$
Paraldehyde

249. *v.* p. 173
B = $C_7H_7Br$
*p*-Bromotoluene

250. *v.* p. 173
B = $C_7H_8$

251. *v.* p. 173
B = $C_8H_{10}$
*p*-Xylene

252. *v.* p. 173
B = $C_{10}H_8$
Naphthalene

253. (55)
B = $C_{10}H_8O$
β-Naphthol

| °C | Wt. % A |
|---|---|
| A | |
| 10.2 | 100 |
| A + B | |
| 9.04E | *ca.* 98.5 |
| B | |
| 121.0 | 0 |

254. (86)
B = $C_{10}H_{20}O$
Menthol

| °C | Mol % A |
|---|---|
| A | |
| 9.7 | 100 |
| 6.1 | 90 |
| A + B | |
| 5.4E | 86.3 |
| B | |
| 8.7 | 80 |
| 12.7 | 70 |
| 15.1 | 60 |
| 18.1 | 50 |
| 21.8 | 40 |
| 25.9 | 30 |
| 30.6 | 20 |
| 35.8 | 10 |
| 41.2 | 0 |

255. *v.* p. 173
B = $C_{12}H_{11}N$
Diphenylamine

256. (413)
B = $C_{12}H_{18}O_8$
Diethyl diacetyltartrate

| | |
|---|---|
| A | |
| 9.95 | 100 |
| 7.90 | 96.61 |
| 5.10 | 91.92 |
| A + B | |
| 1.95E | 86.6 |
| B | |
| 5.3 | 83.39 |
| 14.05 | 75.39 |
| 23.6 | 65.82 |
| 34.2 | 54.03 |
| 42.4 | 42.11 |
| 46.9 | 34.26 |
| 52.0 | 25.60 |
| 55.5 | 19.11 |
| 60.8 | 9.47 |
| 64.5 | 3.55 |
| 67.0 | 0.00 |

$C_2H_4Cl_2$
Ethylene dichloride
257. *v.* p. 173
B = $C_6H_6$

258. *v.* p. 173
B = $C_{10}H_8$
Naphthalene

**$C_2H_4N_4$**
Dicyanodiamide
259. (156)
B = $C_2H_6O$
Ethyl alcohol

| °C | g A per 100 g B |
|---|---|
| 0 | 0.937 |
| 10 | 1.18 |
| 20 | 1.47 |
| 30 | 1.91 |
| 40 | 2.55 |
| 50 | 3.31 |
| 60 | 4.12 |

260. (156)
B = $C_4H_{10}O$
Ethyl ether

| | |
|---|---|
| 0 | 0.0006 |
| 10 | 0.0009 |
| 20 | 0.0013 |
| 30 | 0.0019 |
| 35.3 | 0.0026 |

*v. also* 56

**$C_2H_4O$**
Acetaldehyde
261. (435)
B = $C_2H_6O$
Ethyl alcohol

| °C | Mol % A |
|---|---|
| A | |
| −123.3 | 100 |
| −125.5 | 90 |
| A + AB | |
| −130.0E | 80 |
| AB | |
| −125.4 | 70 |
| −123.2 | 60 |
| **−122.2** | **50** |
| AB + $AB_2$ | |
| −131.0E | 40 |
| $AB_2$ | |
| **−122.9** | **33** |
| −132.1 | 25 |
| $AB_2$ + B | |
| −140E | 21 |
| B | |
| −126.5 | 15 |
| −120.8 | 10 |
| −114.0 | 0 |

262. (186)
B = $C_6H_{12}O_3$
Paraldehyde

| | |
|---|---|
| A | |
| −118.45 | 100 |
| A + B | |
| −119.9E | 98.6 |
| B | |
| − 71.0 | 90 |
| − 45.0 | 80 |
| − 31.0 | 70 |
| − 21.0 | 60 |
| − 13.8 | 50 |
| − 7.7 | 40 |
| − 2.5 | 30 |
| + 2.8 | 20 |

262.—(*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| 7.6 | 10 |
| 12.55 | 0 |

**$C_2H_4O_2$**
Acetic acid
263. (255)
B = $C_2H_5NO$
Acetamide

| | |
|---|---|
| A | |
| 16.7 | 100 |
| 12.7 | 95 |
| 9.2 | 90 |
| + 5.1 | 85 |
| − 0.4 | 80 |
| A + AB | |
| −16.5E | 69.4 |
| AB | |
| − 8.5 | 60 |
| AB + B | |
| − 5.5U | 52 |
| B | |
| +26.5 | 40 |
| 43.5 | 30 |
| 50.8 | 25 |
| 57.5 | 20 |
| 69.8 | 10 |
| 80.0 | 0 |

264. (385)
B = $C_2H_6O$
Ethyl alcohol

| | |
|---|---|
| 16.7 | 100 |
| 10.8 | 90 |
| + 4.2 | 80 |
| − 3.0 | 70 |
| −11.6 | 60 |
| −22.2 | 50 |
| −35.2 | 40 |
| −53.4 | 30 |
| −81.0 | 20 |

265. (385)
B = $C_3H_8O$
Propyl alcohol

| | |
|---|---|
| 16.7 | 100 |
| 10.5 | 90 |
| + 4.3 | 80 |
| − 3.0 | 70 |
| −11.2 | 60 |
| −21.1 | 50 |
| −33.9 | 40 |
| −51.8 | 30 |
| −68.5 | 20 |

266. (385)
B = $C_4H_6O_3$
Acetic anhydride

| | |
|---|---|
| 16.7 | 100 |
| 11.0 | 90 |
| + 5.4 | 80 |
| − 0.2 | 70 |
| − 5.8 | 60 |
| −12.4 | 50 |
| −19.8 | 40 |
| −30.0 | 30 |
| −44.8 | 20 |
| −68.1 | 10 |

267. *v.* p. 173
B = $C_4H_6O_4$
Dimethyl oxalate

268. (385)
B = $C_4H_8O_2$
Ethyl acetate

| °C | Mol % A |
|---|---|
| 16.7 | 100 |
| 9.7 | 90 |
| + 2.1 | 80 |
| − 6.1 | 70 |
| −14.4 | 60 |
| −24.1 | 50 |
| −34.0 | 40 |
| −47.3 | 30 |
| −64.8 | 20 |

269. (385)
B = $C_4H_{10}O$
Ethyl ether

| | |
|---|---|
| 16.7 | 100 |
| 10.5 | 90 |
| + 4.0 | 80 |
| − 3.2 | 70 |
| −11.3 | 60 |
| −20.2 | 50 |
| −29.5 | 40 |
| −42.0 | 30 |
| −59.5 | 20 |

270. (210)
B = $C_6H_3N_3O_7$
Picric acid

| | |
|---|---|
| A | |
| 16.4 | 100 |
| A + B | |
| 14.1E | 96.4 |
| B | |
| 50.8 | 90 |
| 69.4 | 80 |
| 80.0 | 70 |
| 87.3 | 60 |
| 93.1 | 50 |
| 98.4 | 40 |
| 103.5 | 30 |
| 108.6 | 20 |
| 113.4 | 10 |
| 118.5 | 0 |

271.
B = $C_6H_4N_2O_4$
*m*-Dinitrobenzene
*v.* Seidell, p. 131

273. (19, 86)
B = $C_6H_5NO_2$
Nitrobenzene

| °C | Mol % A |
|---|---|
| A | |
| 16.7 | 100 |
| 11.0 | 90 |
| 6.3 | 80 |
| +2.5 | 70 |
| −1.2 | 60 |
| −5.4 | 50 |
| A + B | |
| −8.2E | 44 |

273.—(*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| −3.3 | 30 |
| −0.3 | 20 |
| +2.6 | 10 |
| 5.6 | 0 |

274. (18, 86, 87, 142, 212, 401)
B = $C_6H_6$

| | |
|---|---|
| A | |
| 16.7 | 100 |
| 10.9 | 90 |
| 6.25 | 80 |
| +2.25 | 70 |
| −1.8 | 60 |
| −5.9 | 50 |
| A + B | |
| −8.8E | 43 |
| B | |
| −4.25 | 30 |
| −0.8 | 20 |
| +2.5 | 10 |
| 5.5 | 0 |

275. *v.* p. 173
B = $C_6H_6O$
Phenol

276. (353)
B = $C_6H_7N$
Aniline

| °C | Mol % A |
|---|---|
| A | |
| 16.6 | 100 |
| 13.1 | 95 |
| + 7.8 | 90 |
| − 6.8m | 85 |
| −16.3m | 80 |
| A + $A_2B$ | |
| − 3.2E | 84.2 |
| $A_2B$ | |
| + 7.6 | 80 |
| 14.0 | 75 |
| 16.3 | 70 |
| **16.7** | **66** |
| 15.7 | 60 |
| 11.8 | 50 |
| + 5.7 | 40 |
| − 2.0 | 30 |
| − 7.2 | 25 |
| −13.7 | 20 |
| $A_2B$ + B | |
| −15.7E | 13.7 |
| $AB_2$ | |
| −20.1m | 40 |
| −19.8m | 28 |
| −18.6m | 25 |
| −16.4m | 20 |
| B | |
| −11.5 | 10 |
| − 8.8 | 5 |
| − 6.0 | 0 |

277. *v.* p. 173
B = $C_6H_{10}O_4$
Dimethyl succinate

279. *v.* p. 173
B = $C_7H_6O_2$
Benzoic acid

280. (255)
B = $C_7H_7NO$
Benzamide

| °C | Mol % A |
|---|---|
| A | |
| 16.7 | 100 |
| 12.0 | 90 |
| +7.0 | 80 |
| A + B | |
| −2.0E | 83 |
| B | |
| +9.0 | 80 |
| 23.7 | 75 |
| 35.5 | 70 |
| 56.4 | 60 |
| 74.2 | 50 |
| 102.0 | 30 |
| 111.6 | 20 |
| 119.4 | 10 |
| 126.5 | 0 |

281. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| | |
|---|---|
| A | |
| 16.4 | 100 |
| 12.8 | 90 |
| 8.6 | 80 |
| +2.7 | 85 |
| A + AB | |
| −3.0E | 80.5 |
| AB | |
| +9.7 | 75 |
| 18.0 | 70 |
| 23.9 | 65 |
| AB + B | |
| 25U | 63 |
| B | |
| 38.5 | 60 |
| 55.8 | 55 |
| 70.8 | 50 |
| 83.5 | 45 |
| 94.0 | 40 |
| 102.5 | 35 |
| 109.4 | 30 |
| 115.0 | 25 |
| 119.8 | 20 |
| 123.8 | 15 |
| 127.2 | 10 |
| 132.1 | 0 |

281.1. (353.1)
B = $C_7H_9N$
*o*-Toluidine

| | |
|---|---|
| A | |
| 16.6 | 100 |
| A + AB | |
| − 5.9E | 83.1 |
| AB | |
| **24.8** | **50** |
| AB + B | |
| −28.5E | 2.0 |
| B | |
| −27.7 | 0 |

281.2. (353.1)
B = $C_7H_9N$
*m*-Toluidine

| °C | Mol % A |
|---|---|
| A | |
| 16.6 | 100 |
| A + $A_2B$ | |
| − 5.6E | 83.9 |
| A + $A_2B$ (Metastable) | |
| − 8.8E | 82.4 |
| $A_2B$ | |
| **10.0** | **66.7** |
| $A_2B$ (Metastable) | |
| **7.3** | **66.7** |
| $A_2B$ + B | |
| −38.5E | 13.5 |
| $A_2B$ + B (Metastable) | |
| −40.0E*ca.* | *ca.* 16.0 |
| B | |
| −31.0 | 0 |

281.3. (353.1)
B = $C_7H_9N$
*p*-Toluidine

| | |
|---|---|
| A | |
| 16.6 | 100 |
| A + $A_2B$ | |
| 6.1E | 88.9 |
| $A_2B$ | |
| **48.0** | **66.7** |
| $A_2B$ + B | |
| 27.9E | 30.4 |
| B | |
| 43.0 | 0 |

282. (375, 377)
B = $C_8H_{10}$
*p*-Xylene

| | |
|---|---|
| A | |
| 16.7 | 100 |
| 11.5 | 90 |
| 8.1 | 80 |
| 3.3 | 70 |
| A + B | |
| 0.5E | 61.7 |
| B | |
| 3.2 | 50 |
| 5.3 | 40 |
| 7.5 | 30 |
| 9.4 | 20 |
| 11.3 | 10 |
| 13.2 | 0 |

282.1. (353.1)
B = $C_8H_{11}N$
Dimethylaniline

| | |
|---|---|
| A | |
| 16.6 | 100 |
| A + AB | |
| − 9.3E | 81.7 |
| AB | |
| +18.9 | 50 |
| AB + B | |
| − 9.6 | 9.4 |
| B | |
| − 4.9 | 0 |

282.2. (353.1)
B = $C_9H_{13}N$
2, 4, 6-Trimethyl-aniline

| °C | Mol % A |
|---|---|
| A | |
| 16.6 | 100 |
| A + B | |
| −24.0 *ca.* | 70.0 |
| B | |
| 2.2 | 0 |

283. (452, 475)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % B |
|---|---|
| 0 | 2.4 |
| 10 | 3.5 |
| 20 | 5.2 |
| 30 | 7.6 |
| 40 | 11.9 |
| 50 | 19.7 |
| 60 | 34.3 |
| 70 | 59.0 |

283.1. (475)
B = $C_{10}H_9N$
β-Naphthylamine

| °C | Mol % A |
|---|---|
| 16.7 | 100 |
| 45.0 | 80 |
| 67.0 | 70 |
| 82.0 | 60 |
| 89.0? | 50 |
| 94.0 | 40 |
| 98.0 | 30 |
| 101.0 | 20 |
| 105.0 | 10 |
| 107.5 | 5 |
| 110.6 | 0 |

284. *v.* p. 173
B = $C_{10}H_{14}O$
Thymol

285. *v.* p. 174
B = $C_{12}H_9N$
Carbazole

286. (345)
B = $C_{13}H_{10}$
Fluorene

| °C | Mol % B |
|---|---|
| 20.0 | 0.80 |
| 30.0 | 1.30 |
| 40.0 | 1.9 |
| 50.0 | 2.9 |
| 60.0 | 4.5 |
| 70.0 | 6.9 |
| 80.0 | 11.6 |

287. *v.* p. 174
B = $C_{14}H_8O_2$
Anthraquinone

288. *v.* p. 174
B = $C_{14}H_{10}$
Anthracene

289. (475)
B = $C_{14}H_{10}$
Phenanthrene

289.—(*Continued*)

| °C | g B per 100 g A |
|---|---|
| 30.0 | 6.0 |
| 40.0 | 9.5 |
| 50.0 | 15.0 |
| 60.0 | 26.0 |
| 70.0 | 46.0 |
| 75.0 | 93.0 |
| 80.0 | 160.0 |

290.
B = $C_{16}H_{18}N_2O_2$
*p*-Azophenetole
*v.* Scidell, p. 104

*v. also* 21, 59, 64, 82, 117, 175, 189, 219, 241

$(C_2H_4O_2)_2$
Acetic acid
290.1. (20)
B = $C_6H_5Cl$
Chlorobenzene

| °C | Mol % A |
|---|---|
| 16.7 | 100 |
| 14.4 | 90 |
| 11.9 | 80 |
| 9.2 | 70 |
| 6.0 | 60 |
| + 2.5 | 50 |
| − 1.0 | 40 |
| − 5.0 | 30 |
| −10.0 | 20 |

290.2. (19, 86)
B = $C_6H_5NO_2$
Nitrobenzene

| | |
|---|---|
| 16.7 | 100 |
| 13.5 | 90 |
| 10.5 | 80 |
| 7.4 | 70 |
| 4.6 | 60 |
| +1.4 | 50 |
| −2.3 | 40 |
| −7.7 | 30 |
| −4.2 | 20 |
| −0.3 | 10 |
| +5.6 | 0 |

290.3. (17)
B = $C_6H_{12}$
Cyclohexane

| | |
|---|---|
| A | |
| 16.7 | 100 |
| 14.0 | 90 |
| 12.6 | 80 |
| 11.7 | 70 |
| 11.2 | 60 |
| 11.0 | 50 |
| 10.8 | 40 |
| 10.5 | 30 |
| 9.9 | 20 |
| 6.7 | 10 |
| 0.0 | 5 |
| A + B | |
| −2.5E | 4.4 |
| B | |
| 6.7 | 0 |

$C_2H_5Cl$
Ethyl chloride
*v.* 18

$C_2H_5I$
Ethyl iodide
291. (482)
B = $C_4H_{10}O$
Ethyl ether

| °C | Mol % A |
|---|---|
| A | |
| − 63.5 | 100 |
| A + B | |
| −125.0E | *ca.* 18 |
| B | |
| −117.6 | 0 |

$C_2H_5NO$
Acetamide
292. *v.* p. 174
B = $C_2H_6O$
Ethyl alcohol
*v. also* 1852

293. *v.* p. 174
B = $C_3H_7NO_2$
Urethane

294. (255)
B = $C_4H_6O_3$
Acetic anhydride

| °C | Mol % A |
|---|---|
| 80.0 | 100 |
| 75.0 | 95 |
| 71.0 | 90 |
| 65.5 | 80 |
| 61.5 | 70 |
| 56.0 | 60 |
| 51.3 | 50 |
| 46.0 | 40 |
| 40.0 | 30 |
| +30.5 | 20 |
| − 0.5 | 10 |

295. (231)
B = $C_6H_5NO_3$
*o*-Nitrophenol

| °C | Wt. % A |
|---|---|
| A | |
| 76.5 | 100 |
| A + B | |
| 41.2 | 5 |
| B | |
| 44.8 | 0 |

296. (231)
B = $C_6H_5NO_3$
*m*-Nitrophenol

| | |
|---|---|
| A | |
| 76.5 | 100 |
| A + AB | |
| 42.1E | 46 |
| AB | |
| **51.5** | **50** |
| AB + B | |
| 25.0 | 22 |
| B | |
| 95.0 | 0 |

297. (231)
B = $C_6H_5NO_3$
*p*-Nitrophenol

| °C | Wt. % A |
|---|---|
| A | |
| 76.5 | 100 |
| A + AB | |
| 66.3E | 69 |
| AB | |
| **96.1** | **25.3** |
| AB + B | |
| 77.5E | 14 |
| B | |
| 112.0 | 0 |

298. (267)
B = $C_6H_6O$
Phenol

| | |
|---|---|
| A | |
| 76.2 | 100.0 |
| 70.0 | 86.3 |
| 60.0 | 71.7 |
| 50.0 | 61.7 |
| 40.0 | 53.8 |
| 30.0 | 47.3 |
| A + $AB_2$ | |
| 27.0E | 46.0 |
| $AB_2$ | |
| 30.0 | 43.4 |
| 40.0 | 29.5 |
| **40.8** | **32.1** |
| 40.0 | 20.0 |
| 30.0 | 11.0 |
| $AB_2$ + B | |
| 27.5E | 8 |
| B | |
| 40.5 | 0 |

*v. also* 1852

299. (231)
B = $C_6H_6O_2$
Catechol

| | |
|---|---|
| A | |
| 76.5 | 100 |
| A + $A_2B$ | |
| 34.7E | 57.5 |
| $A_2B$ | |
| **37.5** | *ca.* **51.7** |
| $A_2B$ + B | |
| 17.6E | 34 |
| B | |
| 102.8 | 0 |

300. (231)
B = $C_6H_6O_2$
Resorcinol

| | |
|---|---|
| A | |
| 76.5 | 100 |
| 32.0 | 69.4 |
| ? | |
| vis. | 69.4 to 48.2 |
| B | |
| 9.0 | 48.2 |
| 108.5 | 0 |

301. (231)
B = $C_6H_6O_2$
Hydroquinol

| °C | Wt. % A |
|---|---|
| A | |
| 76.5 | 100 |
| A + AB | |
| 60.3E | 73.0 |
| AB | |
| **101.0** | **35** |
| AB + B | |
| 98.8E | 33.5 |
| B | |
| 169.0 | 0 |

302. (273)
B = $C_6H_6O_3$
Pyrogallol

| | |
|---|---|
| A | |
| 76.5 | 100 |
| 67.5 | 83.9 |
| 58.4 | 76.5 |
| 46 | 68.2 |
| 20 | 57.6 |
| A + (?) | |
| 11E | 54.0 |
| No solid phase | |
| B | |
| 44 | 29.2 |
| 70 | 24.5 |
| 86 | 19.4 |
| 108.4 | 9.6 |
| 126 | 0.0 |

303. (255)
B = $C_7H_6O_2$
Benzoic acid

| °C | Mol % A |
|---|---|
| A | |
| 80.0 | 100 |
| 76.0 | 95 |
| 72.2 | 90 |
| 69.0 | 80 |
| 54.3 | 70 |
| 48.7 | 60 |
| A + B | |
| 38.0E | 55 |
| B | |
| 56.0 | 50 |
| 80.7 | 40 |
| 94.0 | 30 |
| 104.5 | 20 |
| 113.7 | 10 |
| 117.5 | 5 |
| 121.5 | 0 |

304. (231)
B = $C_7H_6O_3$
Salicylic acid

| °C | Wt. % A |
|---|---|
| A | |
| 76.5 | 100 |
| A + AB | |
| 52.2E | 52 |
| AB + B | |
| 63.0U | 35 |
| B | |
| 157 | 0 |

305. (294)
B = $C_8H_6O_2$
Phthalide

| °C | Wt. % A |
|---|---|
| $A_s$ | |
| 79.2 | 100 |
| $A_m$ | |
| 69.1 | 100 |
| $A_m$ + $B_s$ | |
| 52.5E | 44.5 |
| $A_m$ + $B_m$ | |
| 47.0E | 28.5 |
| $A_s$ + $B_s$ | |
| 57.5E | 25 |
| $A_s$ + $B_m$ | |
| 52.6E | 15.5 |
| $B_m$ | |
| 65.0 | 0 |
| $B^s$ | |
| 72.8 | 0 |

306. (269)
B = $C_8H_{10}N_2O$
Nitrosodimethyl-aniline

| | |
|---|---|
| A | |
| 76.2 | 100 |
| A + $AB_2$ | |
| 62.5E | 29 |
| $AB_2$ | |
| **70.0** | **16.4** |
| $AB_2$ + B | |
| 70E *ca.* | 13 |
| B | |
| 83.2 | 0 |

307. (231)
B = $C_{10}H_8O$
α-Naphthol

| | |
|---|---|
| A | |
| 76.5 | 100 |
| A + B | |
| 9.4E | 33 |
| B | |
| 92.0 | 0 |

308. (231)
B = $C_{10}H_8O$
β-Naphthol

| | |
|---|---|
| A | |
| 76.5 | 100 |
| A + AB | |
| 53.2E | 52 |
| AB | |
| **63.0** | **30** |
| AB + B | |
| 61.4E | 25 |
| B | |
| 122.0 | 0 |

309. (100)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 82.0 | 100 |
| A + B | |
| 70.2E | 87 5 |

## $C_2H_5NO_2$—(*Continued*)

309.—(*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| 178.0 | 0 |

310. (255)
B = $C_{14}H_{10}O_3$
Benzoic anhydride

| °C | Mol % A |
|---|---|
| A | |
| 82.0 | 100 |
| 79.5 | 95 |
| 76.5 | 90 |
| 71.0 | 80 |
| A + AB | |
| 68.0E | 75 |
| AB | |
| 73.0 | 70 |
| 81.0 | 60 |
| **84.0** | **50** |
| 80.5 | 40 |
| 72.0 | 30 |
| 58.0 | 20 |
| 41.0 | 10 |
| AB + B | |
| 36.0E | 7 |
| B | |
| 42.0 | 0 |

311. (294)
B = $C_{19}H_{17}N_3$
Triphenylguanidine

| °C | Wt. % A |
|---|---|
| $A_s$ | |
| 79.2 | 100 |
| $A_m$ | |
| 69.1 | 100 |
| $A_m + B_s$ | |
| 68.0E | 95.75 |
| $A_m + B_m$ | |
| 67.8E | 94.9 |
| $A_s + B_s$ | |
| 77.8E | 93.5 |
| $A_s + B_m$ | |
| 77.6E | 92.1 |
| $B_m$ | |
| 138 | 0 |
| $B_s$ | |
| 144.2 | 0 |

*v. also* 263, 1852

## $C_2H_6N_2O$
Methylurea

313. (229)
B = $C_6H_6O$
Phenol

| °C | Wt. % A |
|---|---|
| A | |
| 98.0 | 100 |
| 94.5 | 95 |
| 90.8 | 90 |
| 83.2 | 80 |
| 74.0 | 70 |
| 61.7 | 60 |
| 43.7 | 50 |
| 30.0 | 45 |

313.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A + AB | |
| +8.0U | 40 |
| AB | |
| − 0.1 | **30** |
| AB + B | |
| − 7.0E | 24 |
| B | |
| +25.1 | 10 |
| 33.9 | 5 |
| 40.6 | 0 |

## $C_2H_6O$
Ethyl alcohol
314. *v.* p. 174
B = $C_3H_7NO_2$
Urethane

315. (477)
B = $C_4H_4O_4$
Fumaric acid

| °C | g B per 100 g A |
|---|---|
| 29.7 | 5.75 |

316. (477)
B = $C_4H_4O_4$
Maleic acid

| | |
|---|---|
| 29.7 | 69.9 |

317. (436)
B = $C_4H_5NO_2$
Succinimide

| °C | Mol % B |
|---|---|
| 60 | 12.4 |
| 40 | 4.77 |
| 20 | 2.04 |
| 0 | 0.88 |

318.
B = $C_5H_{11}NO_2$
Betaine
*v.* Seidell, p. 149

319.
B = $C_6H_3N_3O_7$
Picric acid
*v.* Seidell, p. 493

320. (419)
B = $C_6H_4Br_2$
*p*-Dibromobenzene

| °C | Mol % B |
|---|---|
| 30 | 3.0 |
| 40 | 4.6 |
| 50 | 7.0 |
| 60 | 11.1 |
| 70 | 21.1 |
| 75 | 46.8 |
| 80 | 76.4 |
| 87 | 100.0 |

321. (71)
B = $C_6H_5NO_3$
*o*-Nitrophenol

| °C | Wt. % A |
|---|---|
| 44.0 | 0 |
| 41.3 | 5 |
| 39.0 | 10 |
| 36.0 | 20 |
| 34.5 | 30 |

321.—(*Continued*)

| °C | Wt. % A |
|---|---|
| 33.5 | 40 |
| 32.0 | 50 |
| 30.0 | 60 |
| 26.0 | 70 |
| 19.3 | 80 |
| 2.5 | 90 |

322. (71)
B = $C_6H_5NO_3$
*m*-Nitrophenol

| | |
|---|---|
| 95.2 | 0 |
| 86.0 | 5 |
| 77.0 | 10 |
| 56.0 | 20 |
| 34.5 | 30 |
| +13.5 | 40 |
| − 8.5 | 50 |

323. (71)
B = $C_6H_5NO_3$
*p*-Nitrophenol

| | |
|---|---|
| 114.0 | 0 |
| 99.5 | 5 |
| 85.0 | 10 |
| 61.0 | 20 |
| 38.0 | 30 |
| +15.0 | 40 |
| − 8.5 | 50 |

323.1. (267, 436)
B = $C_6H_6O$
Phenol

| | |
|---|---|
| 10.0 | 15.0 |
| 20.0 | 11.1 |
| 30.0 | 6.2 |
| 40.5 | 0.0 |

*v. also* 1852

324. (436)
B = $C_6H_6O_2$
Resorcinol

| °C | Mol % A |
|---|---|
| 110.4 | 0 |
| 75.0 | 40 |
| 58.2 | 50 |
| 25.2 | 60 |

325.
B = $C_7H_5NO_4$
*o*-Nitrobenzoic acid
*v.* Seidell, p. 141, 143

326.
B = $C_7H_5NO_4$
*m*-Nitrobenzoic acid
*v.* Seidell, p. 141, 143

327.
B = $C_7H_5NO_4$
*p*-Nitrobenzoic acid
*v.* Seidell, p. 141, 144

328. (443)
B = $C_7H_5N_5O_8$
Trinitrophenylmethylnitroamine (Tetryl)

328.—(*Continued*)

| °C | g B per 100 g A |
|---|---|
| 0 | 0.320 |
| 10 | 0.425 |
| 20 | 0.563 |
| 30 | 0.76 |
| 40 | 1.12 |
| 50 | 1.72 |
| 60 | 2.64 |
| 70 | 4.23 |

329. B = $C_7H_6O_2$
Benzoic acid
*v.* Seidell, p. 134, 135, 136

331. (426)
B = $C_7H_6O_3$
Salicylic acid

| °C | Wt. % A |
|---|---|
| 159.0 | 0 |
| 142.0 | 10 |
| 123.0 | 20 |
| 104.5 | 30 |
| 84.0 | 40 |
| 62.5 | 50 |
| 40.0 | 60 |
| 0.0 | 70 |

332. (426)
B = $C_7H_6O_3$
*m*-Hydroxybenzoic acid

| | |
|---|---|
| 201.3 | 0 |
| 184.0 | 10 |
| 166.0 | 20 |
| 148.0 | 30 |
| 129.5 | 40 |
| 106.0 | 50 |
| 68.0 | 60 |

333. (426)
B = $C_7H_6O_3$
*p*-Hydroxybenzoic acid

| | |
|---|---|
| 213.0 | 0 |
| 197.0 | 10 |
| 178.0 | 20 |
| 156.0 | 30 |
| 135.0 | 40 |
| 110.0 | 50 |
| 72.0 | 60 |

334. (436)
B = $C_7H_7NO$
Benzamide

| °C | Mol % B |
|---|---|
| 72.3 | 20.86 |
| 50.4 | 14.44 |
| 32.6 | 8.72 |
| 10.4 | 4.25 |
| 0.0 | 3.08 |

335. *v.* p. 174
B = $C_7H_9N$
*p*-Toluidine

336. B = $C_8H_6O_4$
*o*-Phthalic acid
*v.* Seidell, p. 490

337.
B = $C_8H_7BrClNO$
2-Bromo-4-chloroacetanilide
*v.* Seidell, p. 4

338.
B = $C_8H_7BrClNO$
4-Bromo-2-chloroacetanilide
*v.* Seidell, p. 4

339.
B = $C_8H_7Br_2NO$
2, 4-Dibromoacetanilide
*v.* Seidell, p. 4

340.
B = $C_8H_7Cl_2NO$
2, 4-Dichloroacetanilide
*v.* Seidell, p. 4

341.
B = $C_8H_8BrNO$
*p*-Bromoacetanilide
*v.* Seidell, p. 4

342.
B = $C_8H_8ClNO$
*p*-Chloroacetanilide
*v.* Seidell, p. 4

343.
B = $C_8H_8O_2$
Phenylacetic acid
*v.* Seidell, p. 12

344.
B = $C_8H_8O_3$
*dl*-Mandelic acid
*v.* Seidell, p. 399

345. *v.* p. 174
B = $C_8H_9NO$
Acetanilide

346.
B = $C_8H_{10}N_4O_2$
Caffeine
*v.* Seidell, p. 186

347.
B = $C_9H_{10}O_2$
Hydrocinnamic acid
*v.* Seidell, p. 570

348. (436, 452)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % B |
|---|---|
| 0.0 | 1.8 |
| 10.0 | 2.45 |
| 20.0 | 3.4 |
| 30.0 | 4.6 |
| 40.0 | 6.55 |
| 50.0 | 10.0 |
| 60.0 | 17.3 |
| 70.0 | 39.2 |

348.1. (475)
B = $C_{10}H_9N$
α-Naphthylamine

348.1.—(*Continued*)

| °C | Mol % A |
|---|---|
| 10.5 | 80 |
| 16.8 | 70 |
| 21.3 | 60 |
| 25.0 | 50 |
| 28.5 | 40 |
| 32.0 | 30 |
| 36.5 | 20 |
| 42.5 | 10 |
| 46.0 | 5 |
| 49.4 | 0 |

349.
B = $C_{10}H_{15}BrO$
α-Bromocamphor
*v.* Seidell, p. 225

349.1. (71.1)
B = $C_{10}H_{16}O$
Camphor

| °C | g B per 100 g A |
|---|---|
| 0.0 | 104.0 |
| 25.0 | 181.0 |
| 52.9 | 311.0 |

350.
B = $C_{10}H_{16}O_4$
Camphoric acid
*v.* Seidell, p. 225

351. (475)
B = $C_{12}H_9N$
Carbazole

| | |
|---|---|
| 20.0 | 0.75 |
| 30.0 | 1.02 |
| 40.0 | 1.35 |
| 50.0 | 1.77 |
| 60.0 | 2.3 |
| 70.0 | 2.95 |

352. (436)
B = $C_{12}H_{10}$
Acenaphthene

| °C | Mol % B |
|---|---|
| 0.0 | 0.57 |
| 10.0 | 0.84 |
| 20.0 | 1.18 |
| 30.0 | 1.69 |
| 40.0 | 2.51 |
| 50.0 | 3.90 |
| 60.0 | 6.43 |
| 70.0 | 11.7 |

353.
B = $C_{12}H_{10}N_2$
Azobenzene
*v.* Seidell, p. 103

354.
B = $C_{12}H_{24}O_2$
Lauric acid
*v.* Seidell, p. 349

355. (345)
B = $C_{13}H_{10}$
Fluorene

| °C | Mol % B |
|---|---|
| 10.0 | 0.38 |
| 20.0 | 0.52 |

355.—(*Continued*)

| °C | Mol % B |
|---|---|
| 30.0 | 0.63 |
| 40.0 | 0.85 |
| 50.0 | 1.17 |
| 60.0 | 1.75 |
| 70.0 | 2.7 |
| 80.0 | 4.6 |

356. *v.* p. 174
B = $C_{14}H_8O_2$
Anthraquinone

357. (475)
B = $C_{14}H_{10}$
Anthracene

| °C | g B per 100 g A |
|---|---|
| 20.0 | 0.077 |
| 30.0 | 0.138 |
| 40.0 | 0.225 |
| 50.0 | 0.33 |
| 60.0 | 0.463 |
| 70.0 | 0.675 |

358. (153, 475)
B = $C_{14}H_{10}$
Phenanthrene

| | |
|---|---|
| 20.0 | 2.5 |
| 30.0 | 3.7 |
| 40.0 | 5.5 |
| 50.0 | 8.1 |
| 60.0 | 12.3 |

358.1. (71.1)
B = $C_{14}H_{10}O_2$
Benzil

| | |
|---|---|
| 0.2 | 1.82 |
| 25.0 | 4.89 |
| 66.4 | 89.6 |

359.
B = $C_{14}H_{28}O_2$
Myristic acid
*v.* Seidell, p. 443

360.
B = $C_{16}H_{32}O_2$
Palmitic acid
*v.* Seidell, p. 474

361.
B = $C_{16}H_{34}O$
Cetyl alcohol
*v.* Seidell, p. 244

362. (163)
B = $C_{16}H_{35}NO_2$
Ammonium palmitate

| °C | A, g/l |
|---|---|
| A | |
| 0 | 0.5 |
| 10 | 0.7 |
| 20 | 1.4 |
| 40 | 4.5 |
| 50 | 11.0 |

363.
B = $C_{18}H_{36}O_2$
Stearic acid
*v.* Seidell, p. 677

364. (163)
B = $C_{18}H_{37}NO_2$
Ammonium oleate

| °C | A, g/l |
|---|---|
| A | |
| 0 | 31.0 |
| 10 | 59.0 |
| 50 | 100.0 |

364.1. (163)
B = $C_{18}H_{39}NO_2$
Ammonium stearate

| A | |
|---|---|
| 0 | 0.1 |
| 10 | 0.3 |
| 20 | 0.5 |
| 30 | 0.9 |
| 40 | 1.8 |
| 50 | 5.5 |

*v. also* 68, 114, 232, 259, 261, 264, 292, 1852

$C_2H_6O$
Methyl ether
365.
B = $C_7H_6O_3$
Salicylic acid
*v.* Seidell, p. 591

*v. also* 19, 63, 172, 240

$C_3H_3Cl_3O_3$
Trichlorolactic acid
366. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| °C | Mol % A |
|---|---|
| A | |
| 113.8 | 100 |
| 110.6 | 95 |
| 106.6 | 90 |
| 100.0 | 85 |
| 88.5 | 80 |
| 70.0 | 75 |
| A + AB | |
| 34.0E | 68.5 |
| AB | |
| 40.3 | 65 |
| 47.8 | 60 |
| 52.6 | 55 |
| **54.5** | **50** |
| 52.8 | 45 |
| AB + B | |
| 50.0E | 41 |
| B | |
| 77.1 | 35 |
| 95.2 | 30 |
| 108.1 | 25 |
| 116.7 | 20 |
| 122.6 | 15 |
| 126.5 | 10 |
| 132.1 | 0 |

$C_3H_5IO_2$
β-Iodopropionic acid
367. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| °C | Mol % A |
|---|---|
| A | |
| 81.2 | 100 |
| 77.2 | 95 |
| 72.7 | 90 |
| 66.9 | 85 |
| 59.4 | 80 |
| 50.2 | 75 |
| 39.0 | 70 |
| 26.3 | 65 |
| A + B | |
| 7.0E | 58 |
| B | |
| 20.7 | 55 |
| 42.5 | 50 |
| 60.3 | 45 |
| 75.0 | 40 |
| 87.4 | 35 |
| 97.8 | 30 |
| 106.7 | 25 |
| 114.0 | 20 |
| 120.0 | 15 |
| 124.5 | 10 |
| 132.1 | 0 |

$C_3H_6O$
Acetone
368. (477)
B = $C_4H_4O_4$
Fumaric acid

| °C | g B per 100 g A |
|---|---|
| 29.7 | 1.72 |

369. (477)
B = $C_4H_4O_4$
Maleic acid

| | |
|---|---|
| 29.7 | 35.77 |

370. (53)
B = $C_6H_5ClO$
*o*-Chlorophenol

| °C | Wt. % A |
|---|---|
| A | |
| −94.0 | 100 |
| A + AB | |
| −97.1E | 87.5 |
| AB | |
| −83.7 | 80 |
| −70.0 | 70 |
| −59.3 | 60 |
| −54.5 | 55 |
| −50.1 | 50 |
| −46.2 | 45 |
| −42.8 | 40 |
| −40.5 | 35 |
| **−39.8** | **31** |
| −42.6 | 25 |
| AB + B | |
| −47.6E | 21.5 |

370.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| −18.0 | 15 |
| − 4.0 | 10 |
| + 3.5 | 5 |
| 8.0 | 0 |

371. (71)
B = $C_6H_5NO_3$
*o*-Nitrophenol

| | |
|---|---|
| 44.0 | 0 |
| 39.0 | 5 |
| 34.4 | 10 |
| 26.1 | 20 |
| 18.0 | 30 |
| +9.1 | 40 |
| −0.4 | 50 |

372. (71)
B = $C_6H_5NO_3$
*m*-Nitrophenol

| | |
|---|---|
| 95.2 | 0 |
| 85.5 | 5 |
| 75.5 | 10 |
| 54.0 | 20 |
| 29.0 | 30 |

373. (71)
B = $C_6H_5NO_3$
*p*-Nitrophenol

| | |
|---|---|
| 114.0 | 0 |
| 103.0 | 5 |
| 89.5 | 10 |
| 61.0 | 20 |
| 26.0 | 30 |

374. (292)
B = $C_6H_6O$
Phenol

| A | |
|---|---|
| −95.0 | 100 |
| $AB_2$ | |
| −59.0 | 80 |
| −40.0 | 70 |
| −22.0 | 60 |
| −14.0 | 55 |
| − 7.2 | 50 |
| − 1.0 | 45 |
| + 4.5 | 40 |
| 9.5 | 35 |
| 13.1 | 30 |
| **15.0** | **23.5** |
| 14.2 | 20 |
| $AB_2$ + B | |
| 4.0E | 15.5 |
| B | |
| 20.0 | 10 |
| 32.0 | 5 |
| 41.0 | 0 |

375. (292)
B = $C_6H_6O_2$
Catechol

| A | |
|---|---|
| −95.0 | 100 |
| AB | |
| −64.0 | 60 |
| −50.0 | 55 |

375.—(*Continued*)

| °C | Wt. % A |
|---|---|
| AB | |
| −40.0 | 50 |
| −33.3 | 45 |
| AB + B | |
| −30.0U | 41 |
| B | |
| +18.0 | 35 |
| 42.0 | 30 |
| 58.0 | 25 |
| 73.0 | 20 |
| 85.5 | 15 |
| 96.0 | 10 |
| 105.6 | 5 |
| 115.0 | 0 |

376. (292)
B = $C_6H_6O_2$
Resorcinol

| A | |
|---|---|
| −95.0 | 100 |
| $A_2B$ | |
| −58.5 | 80 |
| −43.0 | 70 |
| −32.0 | 60 |
| −28.9 | 55 |
| **−28.5** | **51** |
| −33.2 | 45 |
| $A_2B$ + B | |
| −45.0E | 41 |
| B | |
| +12.0 | 35 |
| 41.5 | 30 |
| 59.5 | 25 |
| 75.0 | 20 |
| 87.7 | 15 |
| 97.8 | 10 |
| 104.5 | 5 |
| 109.0 | 0 |

377. (292)
B = $C_6H_6O_2$
Hydroquinol

| A | |
|---|---|
| −95.0 | 100 |
| AB | |
| − 4.0 | 90 |
| +22.0 | 80 |
| 42.0 | 70 |
| 52.5 | 60 |
| 64.0 | 50 |
| 137.0 | 40 |
| **148** *ca.* | **34.5** |
| 147.0 | 30 |
| B | |
| 145.0 | 20 |
| 158.5 | 10 |
| 169.0 | 0 |

378. (292)
B = $C_6H_6O_3$
Pyrogallol

| A | |
|---|---|
| −95.0 | 100 |
| $A_3B$ | |
| −63.0 | 90 |
| −42.7 | 80 |
| −29.5 | 70 |

378.—(*Continued*)

| °C | Wt. % A |
|---|---|
| $A_2B$ | |
| **−23.9** | **58** |
| −24.4 | 55 |
| −27.5 | 50 |
| $A_3B$ + B | |
| −34.0E | 45 |
| B | |
| + 8.5 | 40 |
| 38.0 | 35 |
| 60.0 | 30 |
| 78.0 | 25 |
| 95.0 | 20 |
| 111.0 | 15 |
| 126.0 | 10 |
| 140.5 | 5 |
| 155.0 | 0 |

379. (71.1, 344)
B = $C_7H_6O_2$
Benzoic acid

| | |
|---|---|
| 121.4 | 0 |
| 72.0 | 40 |
| 54.5 | 50 |
| 34.5 | 60 |
| 6.5 | 70 |

379.1. (316)
B = $C_7H_6O_3$
Salicylic acid

| °C | g B per 100 g A |
|---|---|
| 25.0 | 55.5 |

380. *v.* p. 174
B = $C_{10}H_8$
Naphthalene

381. *v.* p. 174
B = $C_{12}H_9N$
Carbazole

381.1. (71.1)
B = $C_{10}H_{16}O$
Camphor

| °C | g B per 100 g A |
|---|---|
| 0.0 | 209.0 |
| 25.0 | 261.0 |
| 45.0 | 372.0 |

382. *v.* p. 174
B = $C_{12}H_{10}$
Acenaphthene

383. *v.* p. 174
B = $C_{13}H_{10}$
Fluorene

384. *v.* p. 174
B = $C_{14}H_8O_2$
Anthraquinone

385. *v.* p. 174
B = $C_{14}H_{10}$
Anthracene

386. *v.* p. 174
B = $C_{14}H_{10}$
Phenanthrene

**$C_3H_6O_2$**
Propionic acid
387.
B = $C_6H_4N_2O_4$
*m*-Dinitrobenzene
*v.* Seidell, p. 131

388. (452)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % B |
|---|---|
| 0.0 | 6.0 |
| 10.0 | 8.4 |
| 20.0 | 11.5 |
| 30.0 | 15.8 |
| 40.0 | 22.2 |
| 50.0 | 31.6 |
| 60.0 | 46.3 |
| 70.0 | 67.2 |

*v. also* 65, 83, 110

**$C_3H_7ClO_2$**
Propionic acid hydrochloride
*v.* 84

**$C_3H_7NO_2$**
Urethane
389. *v.* p. 174
B = $C_3H_8O$
Propyl alcohol

390. *v.* p. 174
B = $C_6H_{12}O$
*n*-Amyl alcohol

391. (392)
B = $C_6H_4N_2O_4$
*m*-Dinitrobenzene

| °C | Mol % A |
|---|---|
| A | |
| 48.3 | 100 |
| A + B | |
| 42.0E | 88.5 |
| B | |
| 52.0 | 80 |
| 61.0 | 70 |
| 67.5 | 60 |
| 71.0 | 50 |
| 73.6 | 40 |
| 77.5 | 30 |
| 81.5 | 20 |
| 85.8 | 10 |
| 90.0 | 0 |

392. (396)
B = $C_6H_6$

| A | |
|---|---|
| 48.3 | 100 |
| 42.5 | 90 |
| 38.7 | 80 |
| 35.7 | 70 |
| 33.1 | 60 |
| 30.6 | 50 |
| 28.1 | 40 |
| 25.3 | 30 |
| 22.0 | 20 |
| 16.0 | 10 |

392.—(*Continued*)

| °C | Mol % A |
|---|---|
| A + B | |
| 4.2E | 3 |
| B | |
| 5.5 | 0 |

393. (326)
B = $C_6H_6O$
Phenol

| A | |
|---|---|
| 48.0 | 100 |
| 42.0 | 90 |
| 34.7 | 80 |
| 24.7 | 70 |
| +12.0 | 60 |
| − 5.3 | 50 |
| A + B | |
| −25.0E | 41.3 |
| B | |
| + 1.0 | 30 |
| 19.0 | 20 |
| 31.5 | 10 |
| 40.5 | 0 |

394. (318, 465)
B = $C_7H_7NO_2$
*p*-Nitrotoluene

| A | |
|---|---|
| 48.3 | 100 |
| 42.6 | 90 |
| 38.6 | 80 |
| 35.1 | 70 |
| A + B | |
| 33.5E | 65 |
| B | |
| 35.6 | 60 |
| 38.7 | 50 |
| 41.2 | 40 |
| 43.5 | 30 |
| 45.3 | 20 |
| 48.0 | 10 |
| 51.3 | 0 |

395. (318, 393)
B = $C_7H_7NO_3$
*p*-Nitroanisole

| A | |
|---|---|
| 48.3 | 100 |
| 43.8 | 90 |
| 39.7 | 80 |
| 36.5 | 70 |
| A + B | |
| 34.2E | 63 |
| B | |
| 38.0 | 50 |
| 40.8 | 40 |
| 43.6 | 30 |
| 46.5 | 20 |
| 49.6 | 10 |
| 52.6 | 0 |

396. (436)
B = $C_7H_8$
Toluene

| | |
|---|---|
| 47.0 | 100 |
| 41.7 | 90 |
| 38.1 | 80 |
| 35.3 | 70 |
| 32.9 | 60 |

396.—(*Continued*)

| °C | Mol % A |
|---|---|
| 30.5 | 50 |
| 28.1 | 40 |
| 25.4 | 30 |
| 22.2 | 20 |
| 16.5 | 10 |
| 0 | 1.77 |

397. *v.* p. 174
B = $C_8H_9NO$
Acetanilide

398. (318)
B = $C_{10}H_7NO_2$
α-Nitronaphthalene

| °C | Mol % A |
|---|---|
| A | |
| 48.3 | 100 |
| 43.3 | 90 |
| A + B | |
| 38.8E | 81 |
| B | |
| 41.5 | 70 |
| 43.8 | 60 |
| 45.8 | 50 |
| 48.3 | 40 |
| 50.5 | 30 |
| 52.2 | 20 |
| 54.5 | 10 |
| 58.0 | 0 |

399. (393)
B = $C_{12}H_{11}N$
Diphenylamine

| A | |
|---|---|
| 48.3 | 100 |
| 44.1 | 90 |
| 39.8 | 80 |
| 35.5 | 70 |
| A + B | |
| 32.2E | 61 |
| B | |
| 36.3 | 50 |
| 39.6 | 40 |
| 42.4 | 30 |
| 45.4 | 20 |
| 48.9 | 10 |
| 53.2 | 0 |

400. (34)
B = $C_{13}H_{10}O_3$
Salol

| A | |
|---|---|
| 48.5 | 100 |
| 43.7 | 90 |
| 39.6 | 80 |
| 36.3 | 70 |
| 33.5 | 60 |
| 31.0 | 50 |
| A + B | |
| 29.0E | 43 |
| B | |
| 33.6 | 30 |
| 36.8 | 20 |
| 39.7 | 10 |
| 42.0 | 0 |

*v. also* 39, 85, 293, 314

**$C_3H_8N_2O$**
*sym*-Dimethylurea
401. (229)
B = $C_6H_6O$
Phenol

| °C | Wt. % A |
|---|---|
| A | |
| 102.0 | 100 |
| 97.5 | 95 |
| 92.5 | 90 |
| 79.0 | 80 |
| 59.0 | 70 |
| 30.2 | 60 |
| A + $AB_2$ | |
| −3.0E | 53 |
| $AB_2$ | |
| +1.5 | 50 |
| 11.2 | 40 |
| **14.0** | **31.8** |
| $AB_2$ + B | |
| 5.0E | 18.5 |
| B | |
| 27.0 | 10 |
| 35.2 | 5 |
| 40.6 | 0 |

**$C_3H_8N_2O$**
*asym*-Dimethylurea
402. (229)
B = $C_6H_6O$
Phenol

| A | |
|---|---|
| 178.0 | 100 |
| 173.8 | 95 |
| 169.2 | 90 |
| 159.0 | 80 |
| 145.7 | 70 |
| 127.4 | 60 |
| 99.0 | 50 |
| 58.5 | 40 |
| A + AB | |
| 25.2U | 34 |
| AB | |
| 14.5 | 20 |
| AB + B | |
| 9.0E | 17 |
| B | |
| 26.0 | 10 |
| 34.8 | 5 |
| 40.6 | 0 |

**$C_3H_8O$**
Propyl alcohol
403. (419)
B = $C_6H_4Br_2$
*p*-Dibromobenzene

| °C | Mol % B |
|---|---|
| 30 | 4.5 |
| 40 | 6.7 |
| 50 | 10.0 |
| 60 | 17.2 |
| 70 | 38.5 |
| 75 | 61.0 |
| 80 | 82.3 |
| 87 | 100.0 |

404.
B = $C_6H_4N_2O_4$
*m*-Dinitrobenzene
*v.* Seidell, p. 131, 132

405. (385)
B = $C_6H_6$

| °C | Mol % A |
|---|---|
| 5.5 | 0 |
| 2.8 | 10 |
| + 1.3 | 20 |
| 0.0 | 30 |
| − 1.6 | 40 |
| − 3.75 | 50 |
| − 6.8 | 60 |
| −12.8 | 70 |
| −24.8 | 80 |
| −47.0 | 90 |
| −59.0 | 92.5 |
| −78.0 | 95 |

406.
B = $C_7H_5NO_4$
*o*-Nitrobenzoic acid
*v.* Seidell, p. 143

407.
B = $C_7H_5NO_4$
*m*-Nitrobenzoic acid
*v.* Seidell, p. 143

408.
B = $C_7H_5NO_4$
*p*-Nitrobenzoic acid
*v.* Seidell, p. 144

409.
B = $C_7H_6O_2$
Benzoic acid
*v.* Seidell, p. 135

410.
B = $C_7H_6O_3$
Salicylic acid
*v.* Seidell, p. 591

411.
B = $C_8H_6O_4$
*o*-Phthalic acid
*v.* Seidell, p. 490

412.
B = $C_8H_8O_2$
Phenylacetic acid
*v.* Seidell, p. 12

413.
B = $C_8H_8O_3$
*dl*-Mandelic acid
*v.* Seidell, p. 399

414.
B = $C_9H_{10}O_2$
Hydrocinnamic acid
*v.* Seidell, p. 570

415. (436, 452)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % B |
|---|---|
| 0.0 | 2.05 |
| 10.0 | 2.6 |
| 20.0 | 3.7 |
| 30.0 | 5.1 |

415.—(*Continued*)

| °C | Mol % B |
|---|---|
| 40.0 | 7.15 |
| 50.0 | 10.9 |
| 60.0 | 19.0 |
| 70.0 | 45.2 |

416.
B = $C_{10}H_{16}O_4$
Camphoric acid
*v.* Seidell, p. 225

417. (436)
B = $C_{12}H_{10}$
Acenaphthene

| °C | Mol % B |
|---|---|
| 0.0 | 0.66 |
| 10.0 | 0.91 |
| 20.0 | 1.31 |
| 30.0 | 1.86 |
| 40.0 | 2.80 |
| 50.0 | 4.40 |
| 60.0 | 7.4 |
| 70.0 | 13.5 |

418.
B = $C_{12}H_{10}N_2$
Azobenzene
*v.* Seidell, p. 103

419.
B = $C_{12}H_{24}O_2$
Lauric acid
*v.* Seidell, p. 349

420.
B = $C_{14}H_{28}O_2$
Myristic acid
*v.* Seidell, p. 443

421.
B = $C_{16}H_{32}O_2$
Palmitic acid
*v.* Seidell, p. 474

*v. also* 69, 265, 389

**$C_3H_8O$**
Isopropyl alcohol
*v.* 70

**$C_4H_4O_4$**
Fumaric acid
422. (477)
B = $C_4H_{10}O$
Ethyl ether

| °C | g A per 100 g B |
|---|---|
| 25.0 | 0.72 |

423. (477)
B = $C_6H_6$

| | |
|---|---|
| 25.0 | 0.003 |

424. (477)
B = $C_8H_{10}$
Xylene

| | |
|---|---|
| 29.7 | 0.027 |

*v. also* 4, 40, 315, 368

## $C_4H_4O_4$
Maleic acid
425. (477)
B = $C_4H_{10}O$
Ethyl ether

| °C | g A per 100 g B |
|---|---|
| 25.0 | 8.19 |

426. (477)
B = $C_6H_6$

| | |
|---|---|
| 25.0 | 0.024 |

427. (72)
B = $C_8H_8O_3$
*l*-Mandelic acid

| °C | Wt. % A |
|---|---|
| A | |
| 137.2 | 100 |
| 133.4 | 90.6 |
| 131.4 | 81 |
| 130.0 | 70 |
| 128.0 | 59.4 |
| 122.2 | 49.9 |
| 115.7 | 40.7 |
| A + B | |
| 112.5E | 37.0 |
| B | |
| 115.3 | 23.8 |
| 119.3 | 19.7 |
| 125.7 | 10.3 |
| 132.9 | 0 |

428. (477)
B = $C_8H_{10}$
Xylene

| °C | g A per 100 g B |
|---|---|
| 29.7 | 0.0085 |

*v. also* 5, 41, 316, 369

## $C_4H_4S$
Thiophene
429. (458)
B = $C_6H_6$

| °C | Mol % A |
|---|---|
| Mix. | |
| −37.1 | 100 |
| −34.3 | 90 |
| −31.5 | 80 |
| −28.2 | 70 |
| −24.3 | 60 |
| −19.4 | 50 |
| −14.0 | 40 |
| − 8.5 | 30 |
| − 3.5 | 20 |
| + 1.2 | 10 |
| 5.4 | 0 |

430. (147)
B = $C_{19}H_{16}$
Triphenylmethane
AB

| | |
|---|---|
| 25.7 | 89.2 |
| 33.5 | 86.5 |
| 44.0 | 78.9 |
| 47.6 | 75.6 |
| 53.5 | 67.1 |
| 57.4 | 55.3 |

430.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB + B | |
| 57.6U | 49.0 |
| B | |
| 62.7 | 44.0 |
| 67.0 | 39.2 |
| 67.2 | 38.7 |
| 74.2 | 29.5 |
| 79.0 | 23.7 |
| 87.2 | 10.1 |
| 92.0 | 0 |

## $C_4H_5BrO_4$
*l*-Bromosuccinic acid
432. (72)
B = $C_4H_5ClO_4$
*d*-Chlorosuccinic acid

| °C | Wt. % A |
|---|---|
| A | |
| 175.7 | 100 |
| 168.9 | 89.5 |
| 163.7 | 79.1 |
| 160.8 | 70.0 |
| 157.2 | 59.9 |
| A + AB (?) | |
| 157.0E | 55.0 |
| AB(?) | |
| 157.3 | 50.0 |
| AB(?) + B | |
| 157.0E | 45.0 |
| B | |
| 161.6 | 30.2 |
| 164.5 | 20.7 |
| 171.5 | 10.2 |
| 176.5 | 0.0 |

433. (72)
B = $C_4H_5ClO_4$
*dl*-Chlorosuccinic acid

| | |
|---|---|
| A | |
| 175.7 | 100 |
| 172.6 | 89.7 |
| 169.3 | 80.9 |
| 165.9 | 69.5 |
| 165.8 | 60.0 |
| 163.1 | 49.5 |
| 159.5 | 39.8 |
| 155.7 | 29.3 |
| 154.1 | 20.0 |
| 153.7 (Min.) | 15.0 |
| 153.9 | 9.7 |
| 156.0 | 0.0 |

## $C_4H_5ClO_2$
α-Chlorocrotonic acid
434. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| °C | Mol % A |
|---|---|
| A | |
| 99.0 | 100 |
| 96.5 | 95 |

434.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 93.2 | 90 |
| 88.3 | 85 |
| 81.3 | 80 |
| 72.6 | 75 |
| 62.0 | 70 |
| 48.4 | 65 |
| A + AB | |
| 39.0E | 62 |
| AB | |
| 44.7 | 55 |
| **45.8** | **50** |
| AB + B | |
| 45.8E | 49 |
| B | |
| 64.4 | 45 |
| 81.5 | 40 |
| 93.9 | 35 |
| 103.0 | 30 |
| 110.3 | 25 |
| 116.8 | 20 |
| 122.0 | 15 |
| 125.9 | 10 |
| 132.1 | 0 |

## $C_4H_5ClO_4$
*d*-Chlorosuccinic acid
435. (72)
B = $C_4H_5ClO_4$
*l*-Chlorosuccinic acid

| | |
|---|---|
| A | |
| 176.0 | 100 |
| 172.7 | 95 |
| 169.5 | 90 |
| 163.0 | 80 |
| 156.5 | 70 |
| A + AB | |
| 152.5E | 64 |
| AB | |
| **156.0** | **50** |
| 154.0 | 40 |
| AB + B | |
| 152.5E | 36 |
| B | |
| 156.5 | 30 |
| 163.0 | 20 |
| 169.5 | 10 |
| 172.7 | 5 |
| 176.0 | 0 |

*v. also* 432

## $C_4H_5Cl_3O_2$
Trichlorobutyric acid
436. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| | |
|---|---|
| A | |
| 57.9 | 100 |
| 55.0 | 95 |
| 50.4 | 90 |
| 42.5 | 85 |
| A + $A_2B$ | |
| 21.0E | 78 |

436.—(*Continued*)

| °C | Mol % A |
|---|---|
| $A_2B$ | |
| 27.2 | 75 |
| 32.6 | 70 |
| **33.8** | **66** |
| $A_2B$ + AB | |
| 32.5E | 64 |
| AB | |
| 44.7 | 60 |
| 52.8 | 55 |
| **56.2** | **50** |
| AB + B | |
| 52.5E | 44.5 |
| B | |
| 74.7 | 40 |
| 92.0 | 35 |
| 104.8 | 30 |
| 113.0 | 25 |
| 119.1 | 20 |
| 123.8 | 15 |
| 127.2 | 10 |
| 132.1 | 0 |

## $C_4H_5N$
Crotononitrile
436.1. (291)
B = $C_6H_7N$
Aniline

| °C | Wt. % A |
|---|---|
| −72.1 | 100 |
| −74.8 | 90 |
| −78.2 | 80 |
| −82.0 | 70 |
| −84.5E | 63 |
| −78.5 | 60 |
| −60.1 | 50 |
| −46.1 | 40 |
| −34.1 | 30 |
| −23.7 | 20 |
| −14.7 | 10 |
| − 6.2 | 0 |

## $C_4H_5N$
Pyrrole
437. (147)
B = $C_{19}H_{16}$
Triphenylmethane
AB

| | |
|---|---|
| 24.6 | 91.9 |
| 29.0 | 89.6 |
| 31.5 | 87.9 |
| AB + B | |
| 33U | *ca.*87 |
| B | |
| 36.8 | 84.2 |
| 42.7 | 79.1 |
| 46.9 | 74.1 |
| 53.2 | 67.2 |
| 60.0 | 58.2 |
| 60.8 | 57.7 |
| 63.9 | 52.6 |
| 65.6 | 49.1 |
| 68.5 | 44.4 |
| 71.1 | 40.2 |
| 80.1 | 25.2 |
| 86.2 | 13.9 |

437.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 89.2 | 8.2 |
| (92.0 | 0) |

## $C_4H_5N$
Vinylacetonitrile
438.1. (291)
B = $C_6H_7N$
Aniline

| | |
|---|---|
| −86.5 | 100 |
| −89.2 | 90 |
| −92.7 | 80 |
| −94.6 | 74.5 |
| −86.5 | 70 |
| −71.0 | 60 |
| −57.8 | 50 |
| −45.7 | 40 |
| −34.1 | 30 |
| −23.7 | 20 |
| −14.7 | 10 |
| − 6.2 | 0 |

## $C_4H_5NO_2$
Succinimide
439. (233)
B = $C_6H_3N_3O_7$
Picric acid

| | |
|---|---|
| 123.0 | 100 |
| A + B | |
| 79.0E | 33.5 |
| B | |
| 121.0 | 0 |

440. (233)
B = $C_6H_4N_2O_5$
2, 4-Dinitrophenol

| | |
|---|---|
| A | |
| 123.0 | 100 |
| A + B | |
| 85.0E | 31.0 |
| B | |
| 111.0 | 0 |

441. (233)
B = $C_6H_5NO_3$
*o*-Nitrophenol

| | |
|---|---|
| A | |
| 123 | 100 |
| A + B | |
| 42.5E | 6.0 |
| B | |
| 44.5 | 0 |

442. (233)
B = $C_6H_5NO_3$
*m*-Nitrophenol

| | |
|---|---|
| A | |
| 123.0 | 100 |
| A + B | |
| 35.0E | 37.0 |
| B | |
| 95.0 | 0 |

443. (233)
B = $C_6H_5NO_3$
*p*-Nitrophenol

| | |
|---|---|
| A | |
| 123.0 | 100 |

443.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A + AB | |
| 61.0U | 45.0 |
| AB + B | |
| 58.5E | 33.0 |
| B | |
| 114.5 | 0 |

444. (233)
B = $C_6H_6O$
Phenol

| | |
|---|---|
| A | |
| 123.0 | 100 |
| A + $A_2B$ | |
| 59.0U | 50.0 |
| $A_2B$ + B | |
| 27.0E | 14.0 |
| B | |
| 41.5 | 0 |

445. (233)
B = $C_6H_6O_2$
Catechol

| | |
|---|---|
| A | |
| 123.0 | 100 |
| A + AB | |
| 77.0E | 63.0 |
| AB | |
| **84.2** | **47.3** |
| AB + B | |
| 73.0E | 32.0 |
| B | |
| 104.0 | 0 |

446. (233)
B = $C_6H_6O_2$
Resorcinol

| | |
|---|---|
| A | |
| 123.0 | 100 |
| A + AB | |
| 95.8E | 79.0 |
| AB | |
| **122.0** | **47.3** |
| AB + B | |
| 98.0E | 18.0 |
| B | |
| 115.0 | 0 |

447. (233)
B = $C_6H_6O_2$
Hydroquinol

| | |
|---|---|
| A | |
| 123.0 | 100 |
| A + AB | |
| 107.0E | 77.0 |
| AB | |
| **139.0** | **47.3** |
| AB + B | |
| 135.0E | 36 |
| B | |
| 169.0 | 0 |

448. (233)
B = $C_6H_6O_3$
Pyrogallol

| | |
|---|---|
| A | |
| 123.0 | 100 |
| A + AB | |
| 95.0E | 74.0 |

$C_4H_5NO_2$.—(*Continued*)

448.—(*Continued*)

| °C | Wt. % A |
|---|---|
| AB | |
| **128.0** | **44.0** |
| AB + B | |
| 104.0E | 13.0 |
| B | |
| 130.0 | 0 |

449. (233)
B = $C_{10}H_8O$
α-Naphthol

| °C | Wt. % A |
|---|---|
| A | |
| 123.0 | 100 |
| A + B | |
| 57.0E | 29.0 |
| B | |
| 95.0 | 0 |

450. (233)
B = $C_{10}H_8O$
β-Naphthol

| °C | Wt. % A |
|---|---|
| A | |
| 123.0 | 100 |
| A + AB | |
| 85.5E | 53.0 |
| AB | |
| **87.5** | **40.7** |
| AB + B | |
| 72.5E | 35.0 |
| B | |
| 121.0 | 0 |

451. (233)
B = $C_{10}H_8O_2$
1, 4-Dihydroxy-naphthalene

| °C | Wt. % A |
|---|---|
| A | |
| 123.0 | 100 |
| A + $A_2B$ | |
| 114.0E | 86.0 |
| $A_2B$ | |
| **133.5** | **55.3** |
| $A_2B$ + B | |
| 126.0E | 43.0 |
| B | |
| 183.0 | 0 |

452. (233)
B = $C_{10}H_8O_2$
1, 6-Dihydroxy-naphthalene

| °C | Wt. % A |
|---|---|
| A | |
| 123.0 | 100 |
| A + AB | |
| 87.5E | 80.0 |
| AB | |
| **127.0** | **34.3** |
| AB + B | |
| 107.0E | 19.0 |
| B | |
| 134.0 | 0 |

453. (233)
B = $C_{10}H_8O_2$
2, 3-Dihydroxy-naphthalene

453.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 123.0 | 100 |
| A + AB | |
| 108.5E | 86.0 |
| AB | |
| **149.5** | **34.3** |
| AB + B | |
| 140.0E | 24.0 |
| B | |
| 162.0 | 0 |

454. (233)
B = $C_{10}H_8O_2$
2, 6-Dihydroxy-naphthalene

| °C | Wt. % A |
|---|---|
| A | |
| 123.0 | 100 |
| A + $A_2B$ | |
| 116.5E | 94.0 |
| $A_2B$ + B | |
| 140U | 60 |
| B | |
| 216 | 0 |

*v. also* 317

## $C_4H_5NS$

Allyl isothiocyanate

455. (284)
B = $C_6H_7N$
Aniline

| °C | Mol % B |
|---|---|
| AB | |
| 34.5 | 10 |
| 58.5 | 20 |
| 71.5 | 30 |
| 82.5 | 40 |
| **98.5** | **50** |
| 78.0 | 60 |
| 58.0 | 70 |
| +46.5 | 80 |
| AB + B | |
| −20.0E | 90 |
| B | |
| −13.0 | 95 |
| − 6.2 | 100 |

## $C_4H_6O_2$

α-Crotonic acid

456. (342)
B = $C_4H_6O_2$
β-Crotonic acid

| °C | Mol % A |
|---|---|
| A | |
| +71.96 | 100 |
| A + B | |
| − 0.5E | 26.5 |
| B | |
| +14.96 | 0 |

457. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| | |
|---|---|
| A | |
| 71 | 100 |
| 67.1 | 95 |

457.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 63.0 | 90 |
| 58.2 | 85 |
| 51.7 | 80 |
| A + AB | |
| 37.0E | 73 |
| AB | |
| 41.7 | 75 |
| 40.8 | 70 |
| 46.0 | 65 |
| AB + B | |
| 50.5U | 58 |
| B | |
| 60.9 | 55 |
| 75.3 | 50 |
| 86.8 | 45 |
| 95.9 | 40 |
| 103.6 | 35 |
| 110.1 | 30 |
| 115.5 | 25 |
| 119.8 | 20 |
| 123.8 | 15 |
| 127.0 | 10 |
| 132.1 | 0 |

*v. also* 118, 176, 190

## $C_4H_6O_3$

Acetic anhydride

458. (255)
B = $C_7H_7NO$
Benzamide

| | |
|---|---|
| 126.5 | 0 |
| 115.5 | 10 |
| 108.0 | 20 |
| 102.0 | 30 |
| 97.0 | 40 |
| 90.0 | 50 |
| 84.0 | 60 |
| 74.0 | 70 |
| 55.0 | 80 |
| 24.0 | 90 |

*v. also* 266, 294

## $C_4H_6O_4$

Succinic acid

458.1. (274.1)
B = $C_6H_3N_3O_7$
Picric acid

| °C | Wt. % A |
|---|---|
| A | |
| 183.0 | 100 |
| A + B | |
| 121.0E | *ca.* 0 |
| B | |
| 121.5 | 0 |

458.2. (274.1)
B = $C_6H_4N_2O_5$
2, 4-Dinitrophenol

| °C | Wt. % A |
|---|---|
| A | |
| 183.0 | 100 |
| A + B | |
| 111.0E | 1 |
| B | |
| 112.0 | 0 |

458.3. (274.1)
B = $C_6H_5NO_3$
*m*-Nitrophenol

| °C | Wt. % A |
|---|---|
| A | |
| 183.0 | 100 |
| A + B | |
| 91.5E | 4.0 |
| B | |
| 95.0 | 0 |

458.4. (274.1)
B = $C_6H_5NO_3$
*p*-Nitrophenol

| °C | Wt. % A |
|---|---|
| A | |
| 183.0 | 100 |
| A + B | |
| 107.0E | 4.5 |
| B | |
| 114.5 | 0 |

458.5. (274.1)
B = $C_6H_6O$
Phenol

| °C | Wt. % A |
|---|---|
| A | |
| 183.0 | 100 |
| A + B | |
| 36.0E | 1.5 |
| B | |
| 41.0 | 0 |

458.6. (274.1)
B = $C_6H_6O_2$
Catechol

| °C | Wt. % A |
|---|---|
| A | |
| 183.0 | 100 |
| A + B | |
| 94.0E | 13.5 |
| B | |
| 104.0 | 0 |

458.7. (274.1)
B = $C_6H_6O_2$
Resorcinol

| °C | Wt. % A |
|---|---|
| A | |
| 183 | 100 |
| A + B | |
| 100.0E | 12.5 |
| B | |
| 115.0 | 0 |

458.8. (274.1)
B = $C_6H_6O_2$
Hydroquinol

| °C | Wt. % A |
|---|---|
| A | |
| 183 | 100 |
| A + B | |
| 128.0E | 41.0 |
| B | |
| 169.5 | 0 |

458.81. (274.1)
B = $C_6H_6O_3$
Pyrogallol

| °C | Wt. % A |
|---|---|
| A | |
| 183.0 | 100 |
| A + B | |
| 110.0E | 11.0 |
| B | |
| 130.0 | 0 |

458.9. (274.1)
B = $C_{10}H_8O$
α-Naphthol

| °C | Wt. % A |
|---|---|
| A | |
| 183.0 | 100 |
| A + B | |
| 90.5E | 2.0 |
| B | |
| 96.0 | 0 |

458.91. (274.1)
B = $C_{10}H_8O$
β-Naphthol

| °C | Wt. % A |
|---|---|
| A | |
| 183.0 | 100 |
| A + B | |
| 117.0E | 2.5 |
| B | |
| 121.5 | 0 |

## $C_4H_6O_4$

Dimethyl oxalate

459. (274.1)
B = $C_6H_3N_3O_7$
Picric acid

| | |
|---|---|
| A | |
| 54.0 | 100 |
| A + B | |
| 38.0E | 56 |
| B | |
| 121.5 | 0 |

459.1. (274.1)
B = $C_6H_4N_2O_5$
2, 4-Dinitrophenol

| | |
|---|---|
| A | |
| 54.0 | 100 |
| A + B | |
| 43.0E | 72 |
| B | |
| 112.5 | 0 |

459.2 (274.1)
B = $C_6H_5NO_3$
*o*-Nitrophenol

| | |
|---|---|
| A | |
| 54.0 | 100 |
| A + B | |
| 26.0E | 37 |
| B | |
| 44.5 | 0 |

459.3. (274.1)
B = $C_6H_5NO_3$
*m*-Nitrophenol

| | |
|---|---|
| A | |
| 54.0 | 100 |
| A + B | |
| 24.0E | 54 |
| B | |
| 95.0 | 0 |

459.4. (274.1)
B = $C_6H_5NO_3$
*p*-Nitrophenol

| | |
|---|---|
| A | |
| 54.0 | 100 |
| A + B | |
| 32.0E | 59.0 |

459.4.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 114.5 | 0 |

459.5. (274.1)
B = $C_6H_6O$
Phenol

| | |
|---|---|
| A | |
| 54.0 | 100 |
| A + $AB_4$ | |
| 28.0E | 64 |
| $AB_4$ | |
| **47.5** | **23.8** |
| $AB_4$ + B | |
| 32.0E | 8 |
| B | |
| 41.5 | 0 |

459.6. (274.1)
B = $C_6H_6O_2$
Catechol

| | |
|---|---|
| A | |
| 54.0 | 100 |
| A + B | |
| 30.0E | 61 |
| B | |
| 103.5 | 0 |

459.7. (274.1)
B = $C_6H_6O_2$
Resorcinol

| | |
|---|---|
| A | |
| 54.0 | 100 |
| A + B | |
| 28.0E | 57 |
| B | |
| 115.0 | 0 |

459.71. (274.1)
B = $C_6H_6O_2$
Hydroquinol

| | |
|---|---|
| A | |
| 54.0 | 100 |
| A + $A_4B$ | |
| 49.5E | 96.5 |
| $A_4B$ | |
| **94.0** | **81.1** |
| $A_4B$ + B | |
| 91.0E | 75.5 |
| B | |
| 169.0 | 0 |

459.8. (274.1)
B = $C_6H_6O_3$
Pyrogallol

| | |
|---|---|
| A | |
| 54.0 | 100 |
| A + B | |
| 35.0E | 67 |
| B | |
| 130.5 | 0 |

459.81. (274.1)
B = $C_7H_9N$
*p*-Toluidine

| | |
|---|---|
| A | |
| 54.0 | 100 |
| A + B | |
| 20.0E | 41.5 |

459.81.—(*Cont'd*)

| °C | Wt. % A |
|---|---|
| B | |
| 44.0 | 0 |

459.9. (274.1)
B = $C_{10}H_8O$
α-Naphthol

| °C | Wt. % A |
|---|---|
| A | |
| 54.0 | 100 |
| A + B | |
| 26.0E | 59 |
| B | |
| 95.0 | 0 |

459.91. (274.1)
B = $C_{10}H_8O$
β-Naphthol

| °C | Wt. % A |
|---|---|
| A | |
| 54.0 | 100 |
| A + B | |
| 39.0E | 69 |
| B | |
| 121.0 | 0 |

*v. also* 119, 191, 267

## $C_4H_6O_6$
*d*-Tartaric acid
460. (72)
B = $C_4H_6O_6$
*l*-Tartaric acid

| °C | Mol % A |
|---|---|
| A | |
| 167.0 | 100 |
| A + AB | |
| 165E | 97 |
| AB | |
| 171.8 | 90 |
| 181.3 | 80 |
| 190.1 | 70 |
| 197.9 | 60 |
| **203.8** | **50** |
| 197.9 | 40 |
| 190.1 | 30 |
| 181.3 | 20 |
| 171.8 | 10 |
| AB + B | |
| 165.0E | 3 |
| B | |
| 167.0 | 0 |

461.
B = $C_4H_{10}O$
Ethyl ether
*v.* Seidell, p. 711

## $C_4H_7NO_4$
*d*-Aminosuccinic acid
462. (72)
B = $C_4H_7NO_4$
*l*-Aminosuccinic acid

462.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB | |
| 146.3 | 80 |
| 147.1 | 70 |
| 147.7 | 60 |
| **148.1** | **50** |
| 147.7 | 40 |
| 147.1 | 30 |
| 146.3 | 20 |
| AB + B | |
| 145.5E | 10 |
| B | |
| 147.3 | 5 |
| 149.0 | 0 |

## $C_4H_8Cl_2S$
β, β-Dichlorodiethyl sulfide
463. (79)
B = $C_6H_{12}Cl_2$
Dichlorohexane

| °C | Wt. % A |
|---|---|
| 13.9 | 100 |
| 10.5 | 90 |
| 7.2 | 80 |
| 3.8 | 70 |
| 0.5 | 60 |

464. (79)
B = $C_6H_{12}Cl_2S$
Dichlorodipropyl sulfide

| | |
|---|---|
| 13.9 | 100 |
| 10.5 | 90 |
| 7.2 | 80 |
| 3.8 | 70 |
| 0.5 | 60 |

*v. also* 6

## $C_4H_8O_2$
Butyric acid
465.
B = $C_6H_4N_2O_4$
*m*-Dinitrobenzene
*v.* Seidell, p. 131

465.1. (452)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % B |
|---|---|
| 0.0 | 7.1 |
| 10.0 | 9.4 |
| 20.0 | 12.6 |
| 30.0 | 17.2 |
| 40.0 | 23.7 |
| 50.0 | 33.3 |
| 60.0 | 47.5 |
| 70.0 | 68.1 |

*v. also* 66

## $C_4H_8O_2$
Isobutyric acid
465.2. (452)
B = $C_{10}H_8$
Naphthalene

| | |
|---|---|
| 0.0 | 6.3 |
| 10.0 | 8.7 |

465.2.—(*Continued*)

| °C | Mol % B |
|---|---|
| 20.0 | 11.5 |
| 30.0 | 16.0 |

## $C_4H_8O_2$
Ethyl acetate
466. (341.5)
B = $C_6H_4N_2O_4$
*m*-Dinitrobenzene

| | |
|---|---|
| 0 | 10.25 |
| 10 | 13.0 |
| 25 | 18.95 |
| 35 | 24.62 |

467. (482)
B = $C_6H_7N$
Aniline

| °C | Mol % A |
|---|---|
| A | |
| −83.6 | 100 |
| −86.8 | 94.8 |
| −92.7 | 85.6 |
| AB | |
| −93.7 | 78.5 |
| −59.0 | 53.4 |
| −47.0 | 47.7 |
| $AB_3$ | |
| −45.4 | 44.1 |
| −40.5 | 42.0 |
| −39.9 | 39.7 |
| $AB_3$ | |
| −37.9 | 33.8 |
| −30.4 | 30.7 |
| −27.6 | 29.2 |
| −27.0 | 26.8 |
| B | |
| −23.7 | 22.2 |
| −14.9 | 11.1 |
| − 6.9 | 0 |

467.1. (316)
B = $C_7H_6O_3$
Salicylic acid

| °C | g B per 100 g A |
|---|---|
| 25.0 | 38.0 |

468. *v.* p. 174
B = $C_{10}H_8$
Naphthalene

468.1. (71.1)
B = $C_{10}H_{14}O$
Thymol

| °C | g B per 100 g A |
|---|---|
| 1.0 | 219.0 |
| 25.0 | 412.0 |

469. *v.* p. 174
B = $C_{14}H_{10}$
Anthracene

470. *v.* p. 174
B = $C_{14}H_{10}$
Phenanthrene

*v. also* 120, 268

## $C_4H_9NO_2$
Methylurethane
470.05 (413)
B = $C_{10}H_{20}O$
Menthol

| °C | Mol % A |
|---|---|
| A | |
| 54.0 | 100 |
| 51.25 | 94.22 |
| 50.2 | 90.98 |
| 49.15 | 85.38 |
| 48.4 | 80.37 |
| 47.7 | 73.97 |
| 46.6 | 65.91 |
| 45.2 | 57.49 |
| 42.9 | 45.40 |
| 40.15 | 36.96 |
| 35.15 | 25.39 |
| A + B | |
| 32.15E | 20.0 |
| B | |
| 35.95 | 13.40 |
| 36.75 | 9.80 |
| 40.15 | 3.30 |
| 42.0 | 0.0 |

## $C_4H_{10}O$
Butyl alcohol
470.1. (475)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % B |
|---|---|
| 0.0 | 2.75 |
| 10.0 | 3.8 |
| 20.0 | 5.2 |
| 30.0 | 7.4 |
| 40.0 | 11.5 |
| 50.0 | 18.7 |
| 60.0 | 34.0 |
| 70.0 | 69.0 |

470.2. (475)
B = $C_{10}H_9N$
β-Naphthylamine

| °C | Mol % A |
|---|---|
| 28.0 | 97.5 |
| 46.5 | 95 |
| 62.5 | 90 |
| 75.5 | 80 |
| 81.5 | 70 |
| 85.6 | 60 |
| 89.0 | 50 |
| 93.5 | 40 |
| 110.6 | 0 |

471. (345)
B = $C_{12}H_{10}$
Acenaphthene

| °C | Mol % B |
|---|---|
| 0.0 | 0.77 |
| 10.0 | 1.11 |
| 20.0 | 1.61 |
| 30.0 | 2.40 |
| 40.0 | 3.63 |
| 50.0 | 5.62 |
| 60.0 | 9.0 |
| 70.0 | 16.2 |
| 80.0 | 32.0 |

## $C_4H_{10}O$
Isobutyl alcohol
472. (419)
B = $C_6H_4Br_2$
*p*-Dibromobenzene

| °C | Mol % B |
|---|---|
| 30 | 5.3 |
| 40 | 7.7 |
| 50 | 11.5 |
| 60 | 19.4 |
| 70 | 43.0 |
| 75 | 63.0 |
| 80 | 84.4 |
| 87 | 100.0 |

473.
B = $C_{12}H_{24}O_2$
Lauric acid
*v.* Seidell, p. 349

474.
B = $C_{14}H_{28}O_2$
Myristic acid
*v.* Seidell, p. 443

475.
B = $C_{16}H_{32}O_2$
Palmitic acid
*v.* Seidell, p. 474

*v. also* 71

## $C_4H_{10}O$
Trimethyl carbinol
476. (251)
B = $C_6H_4N_2O_5$
2, 4-Dinitrophenol

| °C | Wt. % A |
|---|---|
| A | |
| 24.0 | 100 |
| A + AB | |
| 20.0 | 97 |
| AB | |
| **89.0** | **29.0** |
| AB + B | |
| 85.0E | 17.0 |
| B | |
| 111.0 | 0 |

477. (251)
B = $C_6H_5NO_3$
*o*-Nitrophenol

| | |
|---|---|
| A | |
| 24.0 | 100 |
| A + $A_2B$ | |
| 11.0E | 90 |
| $A_2B$ | |
| **36.0** | **51.6** |
| $A_2B$ + B | |
| 31.0E | 42.0 |
| B | |
| 45.0 | 0 |

478. (251)
B = $C_6H_5NO_3$
*m*-Nitrophenol

| | |
|---|---|
| A | |
| 24.0 | 100 |
| A + $A_2B$ | |
| 1.0E | 80 |

478.—(*Continued*)

| °C | Wt. % A |
|---|---|
| $A_2B$ | |
| **34.5** | **51.6** |
| $A_2B$ + B | |
| 28.0E | 43.0 |
| B | |
| 95.0 | 0 |

479. (251)
B = $C_6H_5NO_3$
*p*-Nitrophenol

| | |
|---|---|
| A | |
| 24.0 | 100 |
| A + $A_2B$ | |
| 7.0 | 82.0 |
| $A_2B$ | |
| **37.5** | **51.6** |
| $A_2B$ + B | |
| 28.0 | 40 |
| B | |
| 114.0 | 0 |

480. (375, 377)
B = $C_6H_6O$
Phenol

| | |
|---|---|
| A | |
| 24.95 | 100.00 |
| 19.7 | 94.51 |
| 15.86 | 91.04 |
| 11.25 | 87.38 |
| A + $A_2B$ | |
| 8.14E | 84.5 |
| $A_2B$ | |
| 13.66 | 79.72 |
| 18.85 | 73.72 |
| 20.6 | 70.78 |
| 22.6 | 65.83 |
| 23.11 | 61.89 |
| **38.9** | **61.1** |
| 22.54 | 57.22 |
| 21.6 | 53.89 |
| 18.17 | 48.51 |
| 15.41 | 45.82 |
| 13.1 | 43.71 |
| 7.54 | 39.44 |
| $A_2B$ + $AB_2$ | |
| 4.48E | 37.86 |
| $AB_2$ | |
| 15.56 | 30.0 |
| **15.75** | **27.27** |
| 15.12 | 24.56 |
| 14.04 | 22.15 |
| $AB_2$ + B | |
| 8.5E | 20.5 |
| B | |
| 12.24 | 19.22 |
| 40.87 | 0 |

481. (270)
B = $C_6H_6O_2$
Catechol

| | |
|---|---|
| A | |
| 23.0 | 100 |
| A + $A_2B$ | |
| 9.5E | 85.5 |
| $A_2B$ | |
| **29.0** | **57.3** |

**$C_4H_{10}O$.—(*Continued*)**

481.—(*Continued*)

| °C | Wt. % A |
|---|---|
| $A_2B + AB_2$ | |
| 24.5 | 50.0 |
| $AB_2$ | |
| **69.7** | **25.2** |
| $AB_2 + B$ | |
| 69.0E | 23.0 |
| B | |
| 103.0 | 0 |

482. (270)
B = $C_6H_6O_2$
Resorcinol

| A | |
|---|---|
| 22.0 | 100 |
| A + $A_2B$ | |
| 9.0E | 89.0 |
| $A_2B$ | |
| **47.3** | **57.3** |
| $A_2B$ + AB | |
| 43.5E | 47.5 |
| AB | |
| **45.8** | **40.2** |
| AB + B | |
| 45.5E | 39.0 |
| B | |
| 109.0 | 0 |

483. (270)
B = $C_6H_6O_2$
Hydroquinol

| A | |
|---|---|
| 23.0 | 100 |
| A + $A_xB_y$ | |
| 22.0E | 97.0 |
| ? | |
| 72.0–167.0 | 78.2–28.4 |
| B | |
| 171.0 | 0 |

484. (270)
B = $C_6H_6O_3$
Pyrogallol

| A | |
|---|---|
| 23.0 | 100 |
| A + $A_2B$ | |
| 16.0E | 94.5 |
| $A_2B$ | |
| **56.2** | **54** |
| $A_2B$ + B | |
| 54.2E | 49.5 |
| B | |
| 126.0 | 0 |

485. (270)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| A | |
|---|---|
| 23.0 | 100 |
| A + B | |
| 21.0E | 97.0 |
| B | |
| 101.1 | 0.0 |

486. (270)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| °C | Wt. % A |
|---|---|
| A | |
| 23.0 | 100 |
| A + B | |
| 21.3 | 93.5 |
| B | |
| 60.5 | 0 |

487. (375)
B = $C_7H_7Br$
*p*-Bromotoluene

| A | |
|---|---|
| 23.52 | 100 |
| A + B | |
| 8.76E | 61.15 |
| B | |
| 26.74 | 0 |

488. (270)
B = $C_7H_9N$
*p*-Toluidine

| A | |
|---|---|
| 23.1 | 100 |
| A + B | |
| 5.1E | 69.5 |
| B | |
| 43.5 | 0 |

489. (377)
B = $C_8H_{10}$
*p*-Xylene

| A | |
|---|---|
| 18.79 | 100.00 |
| 9.88 | 87.94 |
| +4.21 | 77.77 |
| −0.61 | 67.99 |
| A + B | |
| −1.80E | 64.46 |
| B | |
| −0.97 | 60.00 |
| +1.74 | 51.65 |
| 4.33 | 40.99 |
| 6.27 | 32.63 |
| 8.76 | 19.42 |
| 10.71 | 8.64 |
| 13.18 | 0.00 |

490. (251)
B = $C_{10}H_8$
Naphthalene

| A | |
|---|---|
| 24.2 | 100 |
| A + B | |
| 19.0E | 95.0 |
| B | |
| 80.3 | 0 |

491. (270)
B = $C_{10}H_8O$
α-Naphthol

| A | |
|---|---|
| +23.0 | 100 |
| A + $A_2B$ | |
| −11.5E | 62.5 |

491.—(*Continued*)

| °C | Wt. % A |
|---|---|
| $A_2B$ | |
| **+ 1.0** | **50.5** |
| $A_2B$ + B | |
| − 3.0E | 44.0 |
| B | |
| +92.5 | 0 |

492. (270)
B = $C_{10}H_8O$
β-Naphthol

| A | |
|---|---|
| 23.0 | 100.0 |
| A + $A_2B$ | |
| 4.0E | 78.0 |
| $A_2B$ | |
| **24.0** | **50.5** |
| $A_2B$ + B | |
| 23.0E | 52.0 |
| B | |
| 122.0 | 0.0 |

493. (270)
B = $C_{10}H_9N$
α-Naphthylamine

| A | |
|---|---|
| 23.0 | 100.0 |
| A + $A_6B$ | |
| 15.0E | 85.0 |
| $A_6B$ | |
| **16.0** | **75.6** |
| $A_6B$ + $A_2B$ | |
| 14.0E | 63.0 |
| $A_2B$ | |
| **24.1** | **50.8** |
| $A_2B$ + $AB_2$ | |
| 21.0E | 45.0 |
| $AB_2$ | |
| **29.5** | **23.1** |
| $AB_2$ + B | |
| 28.5E | 9.0 |
| B | |
| 48.1 | 0.0 |

494. (270)
B = $C_{10}H_9N$
β-Naphthylamine

| A | |
|---|---|
| 23.0 | 100 |
| A + $A_2B$ | |
| 18.0E | 96 |
| $A_2B$ + $AB_2$ | |
| 70.0U | 71 |
| $A_2B$ + $AB_2$ | |
| 75.5mU | 55 |
| $A_2B$ | |
| **92.0** | ***ca.* 50.0** |
| $A_2B$ + $AB_2$ | |
| 90.0E | 47.0 |
| $AB_2$ | |
| **95.5** | **23.1** |
| $AB_2$ + B | |
| 95.5E *ca.* | 22.0 |
| B | |
| 109.0 | 0 |

495. (375)
B = $C_{10}H_{14}O$
Thymol

| °C | Wt. % A |
|---|---|
| A | |
| 24.97 | 100.00 |
| 17.87 | 89.58 |
| + 6.74 | 79.74 |
| −12.82 | 69.9 |
| No solid phase | |
| B | |
| − 3.72 | 27.87 |
| +18.84 | 20.02 |
| 37.71 | 9.46 |
| 49.12 | 0.00 |

**$C_4H_{10}O$**
Ethyl ether
496. *v.* p. 174
B = $C_6H_4Br_2$
*p*-Dibromobenzene

497. (71)
B = $C_6H_5NO_3$
*o*-Nitrophenol

| °C | Wt. % A |
|---|---|
| 44.0 | 0 |
| 40.6 | 5 |
| 37.5 | 10 |
| 31.7 | 20 |
| 27.1 | 30 |
| 23.0 | 40 |
| 18.6 | 50 |
| 12.7 | 60 |
| 4.0 | 70 |

498. (71)
B = $C_6H_5NO_3$
*m*-Nitrophenol

| | |
|---|---|
| 95.2 | 0 |
| 89.0 | 5 |
| 83.0 | 10 |
| 70.0 | 20 |
| 53.5 | 30 |
| +27.5 | 40 |
| − 7.0 | 50 |

499. (71)
B = $C_6H_5NO_3$
*p*-Nitrophenol

| | |
|---|---|
| 114.0 | 0 |
| 106.3 | 5 |
| 101.0 | 10 |
| 89.2 | 20 |
| 67.5 | 30 |
| 38.3 | 40 |

500. (385)
B = $C_6H_6$

| °C | Mol % A |
|---|---|
| + 5.5 | 0 |
| − 1.3 | 10 |
| − 8.2 | 20 |
| −15.8 | 30 |
| −24.5 | 40 |
| −34.3 | 50 |
| −45.5 | 60 |
| −58.5 | 70 |
| −74.0 | 80 |

501. (443)
B = $C_7H_5N_3O_8$
Trinitrophenylmethylnitroamine
(Tetryl)

| °C | g B per 100 g A |
|---|---|
| 0 | 0.188 |
| 10 | 0.330 |
| 20 | 0.418 |
| 30 | 0.493 |

501.1. (71.1)
B = $C_7H_6O_2$
Benzoic acid

| | |
|---|---|
| 0.0 | 23.3 |
| 25.0 | 40.8 |

502.
B = $C_8H_{10}N_4O_2$
Caffeine
*v.* Seidell, p. 186

503. *v.* p. 174
B = $C_{10}H_8$
Naphthalene

504. *v.* p. 174
B = $C_{14}H_8O_2$
Anthraquinone

505. *v.* p. 174
B = $C_{14}H_{10}$
Phenanthrene

*v. also* 20, 42, 260, 269, 291, 422, 425, 461

**$C_4H_{11}N$**
Diethylamine
506. (385)
B = $C_6H_6$

| °C | Wt. % A |
|---|---|
| A | |
| −49.3 | 100.00 |
| −50.0 | 93.90 |
| −52.4 | 82.10 |
| A + B | |
| −54.5E | 76.41 |
| B | |
| −50.3 | 70.84 |
| −41.51 | 60.06 |
| −32.0 | 49.74 |
| −24.2 | 39.85 |
| −16.01 | 30.36 |
| − 8.91 | 21.25 |
| − 3.44 | 12.54 |
| + 5.44 | 0.00 |

**$C_5BrCl_5O$**
Pentachloromonobromo-α-keto-γ-R-pentene
507. (287)
B = $C_5Cl_6O$
Hexachloro-α-keto-γ-R-pentene

| °C | Mol % A |
|---|---|
| A | |
| 97.91 | 100 |

507.—(*Continued*)

| °C | Mol % A |
|---|---|
| Mix. | |
| (?) | (?) |
| B | |
| 87.5 | 0 |

**$C_5H_5N$**
Pyridine
508. (53)
B = $C_6H_5ClO$
*o*-Chlorophenol

| A | |
|---|---|
| −40.7 | 100 |
| −44.5 | 95 |
| −49.0 | 90 |
| −59.5 | 80 |
| A + AB | |
| −63.0E | 76.9 |
| AB | |
| −45.0 | 70 |
| −28.0 | 60 |
| **−21.6** | **50** |
| −28.0 | 40 |
| AB + B | |
| −36.9E | 33.9 |
| B | |
| −30.0 | 30 |
| −14.0 | 20 |
| − 7.0 | 15 |
| − 0.5 | 10 |
| + 4.3 | 5 |
| 8.0 | 0 |

509. *v.* p. 174
B = $C_6H_6$

510. (53, 151)
B = $C_6H_6O$
Phenol

| °C | Mol % A |
|---|---|
| A | |
| −39.0 | 100 |
| −42.7 | 95 |
| −47.0 | 90 |
| A + AB | |
| −57.0E | 82 |
| AB | |
| −28.0 | 70 |
| −14.7 | 60 |
| **− 9.5** | **50** |
| AB + $AB_2$ | |
| −11.0E | 46.4 |
| $AB_2$ | |
| 0.0 | 40 |
| **3.5** | **33.3** |
| + 3.0 | 30 |
| $AB_2$ + B | |
| − 2.0E | 23 |
| B | |
| + 7.0 | 20 |
| 19.5 | 15 |
| 29.5 | 10 |
| 36.5 | 5 |
| 40.5 | 0 |

511. (9)
B = $C_7H_6O_2$
Benzoic acid

| °C | Mol % A |
|---|---|
| A | |
| −38.0 | 100 |
| A + AB | |
| −42.2E | 95 |
| AB | |
| +43.7 | **50** |
| AB + B | |
| 42.8E | 45.6 |
| B | |
| (121.5 | 0) |

512. (53, 151)
B = $C_7H_8O$
*o*-Cresol

| °C | Wt. % A |
|---|---|
| A | |
| −39.0 | 100 |
| −42.7 | 95 |
| A + AB | |
| −49.5E | 87.5 |
| AB | |
| −30.0 | 80 |
| −11.5 | 70 |
| − 1.7 | 60 |
| + 1.3 | **50** |
| − 7.0 | 40 |
| AB + B | |
| −34.0E | 31.8 |
| B | |
| + 9.5 | 20 |
| 16.8 | 15 |
| 22.0 | 10 |
| 26.0 | 5 |
| 29.7 | 0 |

513. (53)
B = $C_7H_8O$
*m*-Cresol

| °C | Mol % A |
|---|---|
| −39.0 | 100 |
| −42.7 | 95 |
| −47.0 | 90 |
| −57.0 | 80 |
| −68.0 | 70 |
| −74.5 | 64.9 |
| −74.5 to −38.3 | vis. |
| −38.3 | 24.5 |
| −25.0 | 20 |
| −13.0 | 15 |
| − 5.0 | 10 |
| + 0.5 | 5 |
| 4.5 | 0 |

514. (53, 151)
B = $C_7H_8O$
*p*-Cresol

| °C | Mol % A |
|---|---|
| A | |
| −39.0 | 100 |
| −42.7 | 95 |
| A + AB | |
| −49.0E | 88 |
| AB | |
| −30.5 | 80 |
| −13.5 | 70 |

514.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB | |
| − 2.5 | 60 |
| + 1.5 | **50** |
| AB + $AB_2$ | |
| − 1.5E | 45 |
| $AB_2$ | |
| + 4.0 | **33** |
| $AB_2$ + B | |
| − 1.5E | 22 |
| B | |
| + 13.5 | 15 |
| 22.3 | 10 |
| 29.0 | 5 |
| 33.5 | 0 |

515. (269)
B = $C_8H_{10}N_2O$
Nitrosodimethylaniline

| °C | Wt. % A |
|---|---|
| $A_4B$ | |
| −10.0 | 83.8 |
| + 4.3 | **67.7** |
| $A_4B$ + B | |
| 0.5E | 64 |
| B | |
| 83.5 | 0 |

516. *v.* p. 174
B = $C_{10}H_8$
Naphthalene

517. (475)
B = $C_{12}H_9N$
Carbazole

| °C | g B per 100 g A |
|---|---|
| 20.0 | 16.0 |
| 30.0 | 18.0 |
| 40.0 | 21.3 |
| 50.0 | 24.5 |
| 60.0 | 28.2 |
| 70.0 | 32.5 |
| 80.0 | 37.5 |
| 100.0 | 48.8 |

518. *v.* p. 174
B = $C_{12}H_{10}$
Acenaphthene

519. *v.* p. 174
B = $C_{13}H_{10}$
Fluorene

520. *v.* p. 174
B = $C_{14}H_8O_2$
Anthraquinone

521. (475)
B = $C_{14}H_{10}$
Anthracene

| °C | g B per 100 g A |
|---|---|
| 20.0 | 2.0 |
| 30.0 | 2.8 |
| 40.0 | 3.8 |
| 50.0 | 5.4 |
| 60.0 | 7.2 |
| 70.0 | 9.6 |

521.—(*Continued*)

| °C | g B per 100 g A |
|---|---|
| 80.0 | 12.8 |
| 90.0 | 17.2 |
| 100.0 | 23.4 |

522. *v.* p. 174
B = $C_{14}H_{10}$
Phenanthrene

523.
B = $C_{19}H_{16}$
Triphenylmethane
*v.* Seidell, p. 434

$C_5H_8O_4$
Dimethyl malonate
*v.* 121

$C_5H_{10}O_2$
Valeric acid
523.2. (452)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % B |
|---|---|
| 0.0 | 5.4 |
| 10.0 | 8.0 |
| 20.0 | 11.6 |
| 30.0 | 16.7 |
| 40.0 | 23.6 |
| 50.0 | 33.0 |
| 60.0 | 47.0 |
| 70.0 | 68.0 |

$C_5H_{11}N$
Piperidine
524. *v.* p. 174
B = $C_6H_{12}$
Cyclohexane

$C_5H_{11}NO_2$
Betaine
*v.* 86, 318

$C_5H_{12}O$
*n*-Amyl alcohol
*v.* 390

$C_5H_{12}O$
Isoamyl alcohol
*v.* 72

$C_6H_2ClN_3O_6$
Picryl chloride
525. (119)
B = $C_6H_3ClN_2O_4$
1-Chloro-2,4-dinitrobenzene

| °C | Wt. % A |
|---|---|
| A | |
| 80.6 | 100 |
| 72.8 | 90 |
| 64.7 | 80 |
| 55.4 | 70 |
| 44.2 | 60 |
| 30.7 | 50 |
| A + B | |
| 25.0E | 46 |

525.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 28.7 | 40 |
| 34.3 | 30 |
| 39.5 | 20 |
| 44.0 | 10 |
| 47.9 | 0 |

526. (104, 106)
B = $C_6H_3N_3O_7$
Picric acid

| A | |
|---|---|
| 81.2 | 100 |
| 74.5 | 90 |
| 67.1 | 80 |
| A + B | |
| 57.5E | 69 |
| B | |
| 74.6 | 60 |
| 88.0 | 50 |
| 96.7 | 40 |
| 103.6 | 30 |
| 109.6 | 20 |
| 115.6 | 10 |
| 122.4 | 0 |

527. (104, 106)
B = $C_{10}H_8$
Naphthalene

| A | |
|---|---|
| 81.2 | 100 |
| A + AB | |
| 63.5E | 91.6 |
| AB | |
| **91.2** | **65.9** |
| AB + B | |
| 66.5E | 28.6 |
| B | |
| 80.0 | 0 |

528. (104, 106)
B = $C_{12}H_8$
Acenaphthylene

| A | |
|---|---|
| 81.2 | 100 |
| A + AB | |
| 67.8E | 93.2 |
| AB | |
| **109.4** | **61.9** |
| AB + B | |
| 78.1E | 26.8 |
| B | |
| 93.0 | 0 |

529. (104, 106)
B = $C_{12}H_{10}$
Acenaphthene

| A | |
|---|---|
| 81.2 | 100 |
| A + AB | |
| 66.2E | 91.5 |
| AB | |
| **113.2** | **61.6** |
| AB + B | |
| 79.8E | 27.3 |
| B | |
| 96.2 | 0 |

530. (104, 106)
B = $C_{13}H_{10}$
Fluorene

| °C | Wt. % A |
|---|---|
| A | |
| 81.2 | 100 |
| A + AB | |
| 50.0E | 84.8 |
| AB | |
| **64.6** | **39.8** |
| AB + B | |
| 60.9E | 52.5 |
| B | |
| 112.3 | 0 |

531. (104, 106)
B = $C_{14}H_{10}$
Anthracene

| A | |
|---|---|
| 81.2 | 100 |
| A + AB | |
| 62.6E | 84.1 |
| AB + B | |
| 141.6U | 63.0 |
| B | |
| 213 | 0 |

532. (104, 106)
B = $C_{14}H_{10}$
Phenanthrene

| A | |
|---|---|
| 81.2 | 100 |
| A + AB | |
| 57.9E | 83.2 |
| AB | |
| **82.4** | **58.1** |
| AB + B | |
| 63.5E | 42.3 |
| B | |
| 99.0 | 0 |

533. (104, 106)
B = $C_{18}H_{18}$
Retene

| A | |
|---|---|
| 81.2 | 100 |
| A + AB | |
| 45.5E | 71.2 |
| AB | |
| **53.5** | **51.3** |
| AB + B | |
| 47.5E | 34.2 |
| B | |
| 95.2 | 0 |

$C_6H_2Cl_2N_2O_4$
1, 4-Dichloro-2, 3-dinitrobenzene
534. (359)
B = $C_6H_2Cl_2N_2O_4$
1, 4-Dichloro-2, 6-dinitrobenzene

| A | |
|---|---|
| 101.2 | 100 |
| A + B | |
| 72.0E | 61.0 |
| B | |
| 106.0 | 0 |

$C_6H_2Cl_2N_2O_4$
1, 4-Dichloro-2, 5-dinitrobenzene
535. (309)
B = $C_6H_2Cl_2N_2O_4$
1, 4-Dichloro-2, 6-dinitrobenzene

| °C | Wt. % A |
|---|---|
| A | |
| 117.1 | 100 |
| A + $A_2B_3$ | |
| 80E *ca.* | 46 |
| $A_2B_3$ | |
| **81.2?** | **40** |
| $A_2B_3$ + B | |
| *ca.* 81.0E | 40 |
| B | |
| 104.9 | 0 |

$C_6H_3BrClNO_2$
1-Bromo-4-chloro-2-nitrobenzene
536. (174)
B = $C_6H_3BrClNO_2$
1-Bromo-4-chloro-3-nitrobenzene
Mix.

| | |
|---|---|
| 67.4 | 100 |
| 66.5† | 65.0 |
| 69.7 | 0 |

$C_6H_3Br_2NO_2$
1, 2-Dibromo-3-nitrobenzene
537. (168)
B = $C_6H_3Br_2NO_2$
1, 2-Dibromo-4-nitrobenzene

| A | |
|---|---|
| 100.0 | 84.0 |
| A + B | |
| 30.5E | |
| B | |
| 36.0 | 34.6 |
| 24.2 | 40.0 |
| 15.6 | 45.2 |
| 13.1 | 47.2 |
| 8.2 | 50.8 |
| 4.2 | 53.8 |
| 0.0 | 56.8 |

$C_6H_3Br_2NO_2$
1, 3-Dibromo-2-nitrobenzene
538. (167)
B = $C_6H_3Br_2NO_2$
1, 3-Dibromo-4-nitrobenzene

| A | |
|---|---|
| 82.6 | 100.0 |
| B | |
| 56.2 | 8.76 |
| 57.4 | 6.16 |
| 59.1 | 2.74 |
| 60.45 | 0.0 |

**$C_6H_3Br_3O$**
Tribromophenol
539. (289)
B = $C_6H_3Cl_3O$
Trichlorophenol

| °C | Mol % A |
|---|---|
| A | |
| 50.0 | 100 |
| 45.0 | 90 |
| 40.4 | 80 |
| 36.5 | 70 |
| 32.3 | 60 |
| 27.6 | 50 |
| 22.75 | 40 |
| A + B | |
| 18.4E | 30.8 |
| B | |
| 20.4 | 20 |
| 22.75 | 10 |
| 25.37 | 0 |

540. (439)
B = $C_6H_3N_3O_6$
1, 3, 5-Trinitrobenzene

| | |
|---|---|
| A | |
| 92.5 | 100.0 |
| A + B | |
| 76.5E | 65.0 |
| B | |
| 122.0 | 0.0 |

541. (42)
B = $C_6H_3Br_3O_2$
Acetyltribromophenol

| | |
|---|---|
| A | |
| 92.5 | 100.0 |
| A + AB | |
| 58.0E | 65.5 |
| AB | |
| **65** *ca.* | **50.0** |
| AB + B | |
| 57.5E | 32.0 |
| B | |
| 82.0 | 0.0 |

**$C_6H_3ClN_2O_4$**
1-Chloro-2, 4-dinitrobenzene
542. (139)
B = $C_6H_6N_2O_2$
*o*-Nitroaniline

| °C | Wt. % A |
|---|---|
| A | |
| 51.0 | 100 |
| A + AB | |
| 31.0E | 78.0 |
| AB | |
| **35.0** | **59.4** |
| AB + B | |
| 33.5E | 55.0 |
| B | |
| 68.2 | 0 |

543. (139)
B = $C_6H_6N_2O_2$
*m*-Nitroaniline

| °C | Wt. % A |
|---|---|
| A | |
| 51.0 | 100.0 |
| A + B | |
| 34.3E | 48.0 |
| B | |
| 111.5 | 0.0 |

544. (139)
B = $C_8H_9NO$
*p*-Aminoacetophenone

| °C | Mol % A |
|---|---|
| A | |
| 51.0 | 100 |
| $AB_2$ | |
| **66** *ca.* | **33** |
| B | |
| 104.8 | 0 |

545. (139)
B = $C_{10}H_9N$
*α*-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 51.0 | 100 |
| A + AB | |
| 38.0E | 78.0 |
| AB | |
| **71.5** | **58.6** |
| AB + B | |
| 34.0E | 23.0 |
| B | |
| 48.3 | 0 |

*v. also* 525

**$C_6H_3Cl_2NO_2$**
1, 2-Dichloro-3-nitrobenzene
546. (165)
B = $C_6H_3Cl_2NO_2$
1, 2-Dichloro-4-nitrobenzene

| | |
|---|---|
| A | |
| 59.9 | 100.00 |
| B | |
| 32.8 | 12.76 |
| 35.9 | 7.63 |
| 40.5 | 0.00 |

**$C_6H_3Cl_2NO_2$**
1, 3-Dichloro-2-nitrobenzene
547. (165)
B = $C_6H_3Cl_2NO_2$
1, 3-Dichloro-4-nitrobenzene

| | |
|---|---|
| A | |
| 70.05 | 100.0 |
| B | |
| 25.49 | 10.48 |
| 27.95 | 5.37 |
| 30.45 | 0.00 |

**$C_6H_3Cl_2NO_2$**
1, 3-Dichloro-4-nitrobenzene
548. (165)
B = $C_6H_3Cl_2NO_2$
1, 3-Dichloro-5-nitrobenzene

| °C | Wt. % A |
|---|---|
| A | |
| 30.45 | 100.00 |
| 29.03 | 96.94 |
| 27.80 | 94.34 |
| 26.57 | 91.93 |
| B | |
| 63.15 | 0.00 |

*v. also* 547

**$C_6H_3Cl_3$**
1, 2, 3-Trichlorobenzene
549.
B = $C_6H_3Cl_3$
1, 2, 4-Trichlorobenzene, *v.* 1853

550.
B = $C_6H_3Cl_3$
1, 3, 5-Trichlorobenzene, *v.* 1853

**$C_6H_3Cl_3$**
1, 2, 4-Trichlorobenzene
551.
B = $C_6H_3Cl_3$
1, 3, 5-Trichlorobenzene
*v.* 549, 1853

**$C_6H_3Cl_3O$**
Trichlorophenol
*v.* 539

**$C_6H_3FN_2O_4$**
1-Fluoro-2, 4-dinitrobenzene
552. (166)
B = $C_6H_4FNO_2$
*p*-Fluoronitrobenzene

| °C | Mol % A |
|---|---|
| A | |
| 24.3 | 100.0 |
| B | |
| 21.0 | 9.0 |
| 23.0 | 6.0 |
| 24.7 | 3.0 |
| 26.4 | 0.0 |

**$C_6H_3N_3O_6$**
1, 3, 5-Trinitrobenzene
553. (43)
B = $C_6H_3N_3O_7$
Picric acid

| °C | Wt. % A |
|---|---|
| Mix. | |
| 120.3 | 100 |
| 114.0 | 90 |
| 113.5† *ca.* | 86 |
| 114.0 | 80 |
| 116.1 | 70 |
| 117.0 | 60 |
| 118.0 | 50 |
| 119.0 | 40 |
| 119.6 | 30 |
| 120.3 | 20 |
| 120.6 | 10 |
| 122.3 | 0 |

554. (110)
B = $C_6H_3N_3O_8$
Styphnic acid

| | |
|---|---|
| A | |
| 121.4 | 100.0 |
| A + B | |
| 83.2E | 64.0 |
| B | |
| 175.5 | 0.0 |

555. *v.* p. 174
B = $C_6H_4N_2O_4$
*o*-Dinitrobenzene

556. *v.* p. 174
B = $C_6H_4N_2O_4$
*m*-Dinitrobenzene

557. (438)
B = $C_6H_6N_2O_2$
*m*-Nitroaniline

| °C | Mol % A |
|---|---|
| A | |
| 122.0 | 100.0 |
| A + AB | |
| 91.0E | 66.0 |
| AB | |
| **96.6** | **50.0** |
| AB + B | |
| 90.3E | 30.5 |
| B | |
| 113.5 | 0.0 |

558. (438)
B = $C_6H_6N_2O_2$
*p*-Nitroaniline

| | |
|---|---|
| A | |
| 122.0 | 100.0 |
| A + AB | |
| 89.0E | 64.0 |
| AB | |
| 91.4U | 55.0 |
| B | |
| 146.2 | 0.0 |

559. (439)
B = $C_6H_6O_2$
Hydroquinol

| | |
|---|---|
| A | |
| 122.0 | 100.0 |
| A + AB | |
| 101.0E | 79.0 |
| AB | |
| **131.0** | **50.0** |
| AB + B | |
| 128.0E | 43.0 |
| 169.0 | 0.0 |

560. (222)
B = $C_6H_7N$
Aniline

| | |
|---|---|
| A | |
| 122.2 | 100.0 |
| 109.0 | 86.1 |
| A + AB | |
| 101E | 82 |
| AB | |
| 110.0 | 75.6 |
| 123.0 | 61.0 |
| **125.0** | **50.0** |
| 124.0 | 41.2 |
| 121.0 | 36.0 |
| 110.5 | 25.0 |
| 102.0 | 19.8 |
| 88.0 | 13.8 |
| 71.0 | 9.0 |
| +16.0 | 2.0 |
| AB + B | |
| − 6.5E | 0.5 |
| B | |
| − 5.5 | 0.0 |

561. (250)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| °C | Wt. % A |
|---|---|
| A | |
| 122.0 | 100.0 |
| A + AB | |
| 108.0E | 97.0 |
| AB | |
| **163.0** | **66.3** |
| AB + B | |
| 92.0E | 7.0 |
| B | |
| 101.0 | 0.0 |

562. (250)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| | |
|---|---|
| A | |
| 122.0 | 100.0 |
| A + AB | |
| 105.0E | 93.0 |
| AB | |
| **168.0** | **66.3** |
| AB + B | |
| 45.0E | 18.0 |
| B | |
| 62.0 | 0.0 |

563. (250)
B = $C_6H_8N_2$
*p*-Phenylenediamine

| | |
|---|---|
| A | |
| 122.0 | 100.0 |
| A + AB | |
| 101.5E | 91.0 |
| AB | |
| **145.5** | **66.3** |
| AB + B | |
| 106.0E | 36.0 |
| 140.0 | 0.0 |

564. *v.* p. 175
B = $C_7H_5N_3O_6$
Trinitrotoluene

565. *v.* p. 175
B = $C_7H_5N_5O_8$
Trinitrophenylmethylnitroamine (Tetryl)

566. (439)
B = $C_7H_8O_2$
Dimethylpyrone

| °C | Mol % A |
|---|---|
| A | |
| 122.0 | 100.0 |
| A + B | |
| 79.0E | 57.0 |
| B | |
| 132.0 | 0.0 |

567. (439)
B = $C_9H_6O_2$
Coumarin

| | |
|---|---|
| A | |
| 122.0 | 100.0 |
| A + $AB_2$ | |
| 41.0E | 43.0 |
| $AB_2$ | |
| **44.0** | **33.3** |
| $AB_2$ + B | |
| 43.0E | 25.0 |
| B | |
| 67.5 | 0.0 |

568. (222, 283)
B = $C_{10}H_8$
Naphthalene

| | |
|---|---|
| A | |
| 122.0 | 100 |
| 118.5 | 95 |
| A + AB | |
| 115.0E | 90 |
| AB | |
| 131.8 | 80 |
| 143.0 | 70 |
| 149.1 | 60 |
| **151.1** | **50** |
| 149.8 | 40 |
| 143.0 | 30 |
| 129.8 | 20 |
| 101.0 | 10 |
| AB+B | |
| 77.0E | 5 |
| B | |
| 80.1 | 0 |

569. (438)
B = $C_{10}H_8N_2$
γ, γ-Dipyridyl

| | |
|---|---|
| A | |
| 122.0 | 100.0 |
| A + AB | |
| 96.5E | 77.0 |
| AB | |
| **111.1** | **50.0** |

569.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB + B | |
| 91.5E | 20.5 |
| B | |
| 112.0 | 0.0 |

570. (237)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 121.0 | 100 |
| 171.0 | 30 |
| 155.0 | 20 |
| 125.0 | 10 |
| AB + B | |
| 47.0E | 2 |
| B | |
| 48.0 | 0 |

571. (237)
B = $C_{10}H_9N$
β-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 121.0 | 100 |
| A + AB | |
| 108.0E | 91.5 |
| AB | |
| 139.5 | 80 |
| 153.9 | 70 |
| **161.8** | **59.8** |
| 136.3 | 50 |
| 144.5 | 40 |
| 126.5 | 30 |
| AB + B | |
| 98.0E | 19 |
| B | |
| 103.5 | 10 |
| 109.0 | 0 |

572. (101)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 120.7 | 100.0 |
| A + B | |
| 73.8E | 34.7 |
| B | |
| 178.0 | 0.0 |

573. (265)
B = $C_{12}H_9N$
Carbazole

| °C | Wt. % A |
|---|---|
| A | |
| 122.0 | 100 |
| A + AB | |
| 120.0E | 97.5 |
| AB | |
| 132.0 | 95 |
| 152.0 | 90 |
| 177.7 | 80 |
| 192.3 | 70 |
| **203.0** | **56** |
| 200.0 | 50 |
| AB + B | |
| 194.5E | 45 |

573.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 200.0 | 40 |
| 210.9 | 30 |
| 220.9 | 20 |
| 229.6 | 10 |
| 236.0 | 0 |

574. (109, 265)
B = $C_{12}H_{10}$
Acenaphthene

| | |
|---|---|
| A | |
| 122.0 | 100 |
| A + AB | |
| 115.0E | 94 |
| AB | |
| 128.3 | 90 |
| 148.2 | 80 |
| 156.6 | 70 |
| **161.0** | **58** |
| 159.7 | 50 |
| 153.7 | 40 |
| 142.0 | 30 |
| 122.5 | 20 |
| AB + B | |
| 87.0E | 8 |
| B | |
| 90.2 | 5 |
| 95.0 | 0 |

575. (439)
B = $C_{12}H_{10}O$
Diphenyl ether

| °C | Mol % A |
|---|---|
| A | |
| 122.0 | 100.0 |
| A + B | |
| 24.5E | 11.0 |
| B | |
| 28.0 | 0.0 |

576. (439)
B = $C_{13}H_8O$
Fluorenone

| | |
|---|---|
| A | |
| 122.0 | 100.0 |
| A + $AB_2$ | |
| 77.5E | 40.0 |
| $AB_2$ | |
| **78.0** | **33.3** |
| $AB_2$ + B | |
| 68.5 | 14.0 |
| B | |
| 82.0 | 0.0 |

577. (439)
B = $C_{13}H_8O_2$
Xanthone

| | |
|---|---|
| A | |
| 122.0 | 100.0 |
| A + B | |
| 93.0E | 74.0 |
| B | |
| 173.0 | 0.0 |

578. (230)
B = $C_{13}H_{10}$
Fluorene

578.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 121.0 | 100.0 |
| 111.3 | 90 |
| A + $A_3B_2$ | |
| 99.5E | 79.0 |
| $A_3B_2$ | |
| 104.7 | 70 |
| **105.0** | **65.7** |
| 99.9 | 50 |
| $A_3B_2$ + B | |
| 86.0E | 36.0 |
| B | |
| 91.0 | 30 |
| 98.8 | 20 |
| 105.7 | 10 |
| 112.5 | 0 |

579. (109, 352)
B = $C_{14}H_{10}$
Anthracene

| | |
|---|---|
| A | |
| 121.5 | 100 |
| A + AB | |
| 112.0E | 95.5 |
| AB | |
| 126.1 | 90 |
| 145.5 | 80 |
| 156.6 | 70 |
| 163.0 | 60 |
| **164.5** | **54.5** |
| AB + B | |
| 162.0E | 49 |
| B | |
| 175.8 | 40 |
| 187.6 | 30 |
| 198.2 | 20 |
| 207.0 | 10 |
| 213.0 | 0 |

580. (228)
B = $C_{14}H_{10}$
Phenanthrene

| | |
|---|---|
| A | |
| 121.0 | 100 |
| 116.6 | 95 |
| 111.1 | 90 |
| A + AB | |
| 105.0E | 85 |
| AB | |
| 110.3 | 80 |
| 119.4 | 70 |
| 124.6 | 60 |
| **125.5** | **54.5** |
| 125.0 | 50 |
| 120.0 | 40 |
| 110.6 | 30 |
| AB + B | |
| 86.0E | 19.5 |
| B | |
| 96.2 | 10 |
| 103.0 | 0 |

581. (109)
B = $C_{18}H_{18}$
Retene

581.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 121.4 | 100.0 |
| A + AB | |
| 93.3E | 77.2 |
| AB | |
| **133.0** | **47.6** |
| AB + B | |
| 70.5E | 15.7 |
| B | |
| 95.2 | 0.0 |

582. (243)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| A | |
| 121.5 | 100.0 |
| A + $A_3B_2$ | |
| 112.0E | 85.0 |
| $A_3B_2$ | |
| **134.5** | **55.1** |
| $A_3B_2$ + B | |
| 133.0E | 52.0 |
| B | |
| 159.0 | 0.0 |

*v. also* 540

$C_6H_3N_3O_7$
Picric acid
583. *v.* p. 175
B = $C_6H_4N_2O_4$
*m*-Dinitrobenzene

584. *v.* p. 175
B = $C_6H_4N_2O_5$
2, 4-Dinitrophenol

585. *v.* p. 175
B = $C_6H_4N_4O_6$
Picramide

586. *v.* p. 175
B = $C_6H_5NO_3$
*o*-Nitrophenol

587. *v.* p. 175
B = $C_6H_5NO_3$
*m*-Nitrophenol

588. *v.* p. 175
B = $C_6H_5NO_3$
*p*-Nitrophenol

589. (278)
B = $C_6H_6$

| °C | Mol % A |
|---|---|
| A | |
| 122.2 | 100 |
| 115.5 | 90 |
| 107.8 | 80 |
| 100.0 | 70 |
| 92.2 | 60 |
| 84.5 | 50 |
| 78.2 | 40 |
| 70.7 | 30 |
| 61.7 | 20 |
| 46.9 | 10 |
| A + B | |
| 4.5E | 1.35 |

589.—(*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| 5.5 | 0 |

*v. also* Seidell, p. 493

591. (219, 381)
B = $C_6H_6O$
Phenol

| | |
|---|---|
| A | |
| 122.5 | 100 |
| 112.2 | 90 |
| 102.1 | 80 |
| 92.0 | 70 |
| A + AB | |
| 81.8E | 60 |
| AB | |
| **84.0** | **50** |
| 82.8 | 40 |
| 78.0 | 30 |
| 70.0 | 20 |
| 52.2 | 10 |
| AB + B | |
| 36.0E | 5.5 |
| B | |
| 40.6 | 0.0 |

592. (383)
B = $C_6H_6O_2$
Catechol

| | |
|---|---|
| A | |
| 120.25 | 100.0 |
| 112.8 | 90.1 |
| 107.3 | 84.1 |
| A + AB | |
| 104.2E | *ca.* 81.5 |
| AB | |
| 112.9 | 71.5 |
| 119.8 | 60.5 |
| **122.4** | **50.0** |
| 120.8 | 40.5 |
| 116.5 | 31.2 |
| 108.8 | 21.9 |
| AB + B | |
| 96.4E | *ca.* 14 |
| B | |
| 97.8 | 10.7 |
| 103.4 | 0.0 |

593. (383)
B = $C_6H_6O_2$
Resorcinol

| | |
|---|---|
| A | |
| 120.25 | 100.0 |
| 112.6 | 90.1 |
| 105.2 | 81.6 |
| 100.8 | 76.7 |
| A + AB | |
| 95.15E | *ca.* 70 |
| AB | |
| 96.6 | 66.3 |
| 98.9 | 59.9 |
| 99.8 | 54.2 |
| **100.3** | **50.0** |
| 99.65 | 43.3 |
| 97.9 | 35.8 |
| 94.7 | 28.1 |
| AB + B | |
| 93.7E | *ca.* 25 |

593.—(*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| 95.8 | 20.8 |
| 102.1 | 10.9 |
| 108.8 | 0.0 |

593.1. (444.1)
B = $C_6H_{10}O_4$
Glycol diacetate

| °C | g A per 100 g B |
|---|---|
| 25.0 | 46.3 |

594. *v.* p. 175
B = $C_7H_5N_3O_8$
Trinitrotoluene

595. (447)
B = $C_7H_5N_5O_8$
Trinitrophenylmethylnitroamine (Tetryl)

| °C | Wt. % A |
|---|---|
| A | |
| 121.0 | 100 |
| 118 7 | 95 |
| 115.2 | 90 |
| 111.7 | 85 |
| 108.0 | 80 |
| 99.9 | 70 |
| 90.0 | 60 |
| 76.7m | 50 |
| A + B | |
| 69.0mE | 46 |
| B | |
| 81.0m | 40 |
| A + AB | |
| 85.5E | 56 |
| AB | |
| **85.5** | **44.4** |
| AB + B | |
| 85.5E | 37 |
| B | |
| 98.3 | 30 |
| 112.5 | 20 |
| 117.3 | 15 |
| 121.8 | 10 |
| 125.2 | 5 |
| 128.72 | 0 |

596. *v.* p. 175
B = $C_7H_6N_2O_4$
2, 4-Dinitrotoluene

597. (258)
B = $C_7H_6O_2$
*m*-Hydroxybenzaldehyde

| | |
|---|---|
| A | |
| 122.0 | 100.0 |
| A + AB | |
| 88.0E | 73.0 |
| AB | |
| **89.0** | **65.2** |
| AB + B | |
| 88.0E | 26.0 |
| B | |
| 105 0 | 0 0 |

**$C_6H_3N_3O_7$.—(*Continued*)**

598. (210)
B = $C_7H_8O$
*o*-Cresol

| °C | Mol % A |
|---|---|
| A | |
| 118.5 | 100 |
| 111.3 | 90 |
| 103.2 | 80 |
| 98.8 | 75 |
| 94.0 | 70 |
| A + AB | |
| 87.0E | 63.4 |
| AB | |
| 88.2 | 60 |
| 89.5 | 55 |
| **89.8** | **50** |
| 89.4 | 45 |
| 88.6 | 40 |
| 87.1 | 35 |
| 84.9 | 30 |
| 81.6 | 25 |
| 77.1 | 20 |
| 71.1 | 15 |
| 62.6 | 10 |
| 47.0 | 5 |
| AB + B | |
| 29.4E | 1.6 |
| B | |
| 30.4 | 0 |

599. (210)
B = $C_7H_8O$
*m*-Cresol

| | |
|---|---|
| A | |
| 118.5 | 100 |
| 111.4 | 90 |
| 103.3 | 80 |
| 98.8 | 75 |
| 94.0 | 70 |
| 88.6 | 65 |
| 83.0 | 60 |
| 76.8 | 55 |
| 70.1 | 50 |
| $A + AB_2$ | |
| 59.5E | 43 |
| $AB_2$ | |
| 60.6 | 40 |
| **61.6** | **33.3** |
| 61.2 | 30 |
| 59.6 | 25 |
| 56.9 | 20 |
| 52.9 | 15 |
| 46.8 | 10 |
| 36.5 | 5 |
| $AB_2 + B$ | |
| 10.2E | 1 |
| B | |
| 10.9 | 0 |

600. (210)
B = $C_7H_8O$
*p*-Cresol

| | |
|---|---|
| A | |
| 118.5 | 100 |
| 111.3 | 90 |

600.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 103.2 | 80 |
| 98.7 | 75 |
| 93.8 | 70 |
| 88.4 | 65 |
| 82.8 | 60 |
| 76.1 | 55 |
| A + AB | |
| 65.5U | 48 |
| AB | |
| 64.8 | 45 |
| 62.8 | 40 |
| 60.1 | 35 |
| 56.5 | 30 |
| 52.4 | 25 |
| 47.1 | 20 |
| 40.5 | 15 |
| 33.3 | 10 |
| AB + B | |
| 29.2E | 7.3 |
| B | |
| 34.5 | 0 |

601. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| | |
|---|---|
| A | |
| 118.4 | 100 |
| 114.7 | 95 |
| 110.1 | 90 |
| 105.2 | 85 |
| 99.8 | 80 |
| 93.9 | 75 |
| A + AB | |
| 84.7E | 68 |
| AB | |
| 90.1 | 65 |
| 96.2 | 60 |
| 99.7 | 55 |
| **100.8** | **50** |
| 99.5 | 45 |
| 95.3 | 40 |
| 86.9 | 35 |
| AB + B | |
| 80.0E | 32 |
| B | |
| 102.3 | 25 |
| 113.4 | 20 |
| 120.8 | 15 |
| 125.6 | 10 |
| 132.1 | 0 |

602. (383)
B = $C_7H_8O_2$
Guaiacol

| | |
|---|---|
| A | |
| 120.25 | 100.0 |
| 112.6 | 90.0 |
| 103.2 | 79.6 |
| 95.9 | 72.0 |
| 88.7 | 66.6 |
| A + AB | |
| 86E | *ca.* 64 |
| AB | |
| 86.45 | 60.2 |
| **87.9** | **50.0** |

602.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB | |
| 87.1 | 39.9 |
| 83.0 | 30.3 |
| 74.8 | 20.4 |
| 58.85 | 9.9 |
| 41.65 | 4.4 |
| AB + B | |
| 26.55E | *ca.* 2.0 |
| B | |
| 27.25 | 1.1 |
| 28.1 | 0.0 |

603. (249)
B = $C_8H_8O$
Acetophenone

| °C | Wt. % A |
|---|---|
| A | |
| 121.0 | 100.0 |
| A + AB | |
| 50.0U | 56.0 |
| AB + B | |
| 16.5E | 15.0 |
| B | |
| 20.5 | 0.0 |

604. (210)
B = $C_8H_8O_2$
Phenylacetic acid

| °C | Mol % A |
|---|---|
| A | |
| 118.5 | 100 |
| 114.2 | 90 |
| 110.1 | 80 |
| 105.8 | 70 |
| 101.6 | 60 |
| 97.3 | 50 |
| 92.6 | 40 |
| 87.3 | 30 |
| 80.0 | 20 |
| A + B | |
| 70.9E | 10 |
| B | |
| 76.6 | 0 |

605. (210)
B = $C_8H_8O_2$
*o*-Toluic acid

| | |
|---|---|
| A | |
| 118.5 | 100 |
| 114.3 | 90 |
| 110.0 | 80 |
| 105.7 | 70 |
| 101.3 | 60 |
| 97.0 | 50 |
| 92.6 | 40 |
| A + B | |
| 88.0E | 29.3 |
| B | |
| 92.7 | 20 |
| 97.8 | 10 |
| 103.4 | 0 |

606. (210)
B = $C_8H_8O_2$
*m*-Toluic acid

| | |
|---|---|
| A | |
| 118.5 | 100 |
| 113.7 | 90 |

606.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 109.8 | 80 |
| 105.4 | 70 |
| 101.1 | 60 |
| 96.8 | 50 |
| 92.4 | 40 |
| A + B | |
| 88.2E | 30.5 |
| B | |
| 96.0 | 20 |
| 102.7 | 10 |
| 109.6 | 0 |

606.1. (274.1)
B = $C_9H_8O_2$
Cinnamic acid

| °C | Wt. % A |
|---|---|
| A | |
| 121.5 | 100 |
| A + AB | |
| 103.0E | 78 |
| AB | |
| **106.5** | **60.7** |
| AB + B | |
| 105.0 | 50 |
| B | |
| 133.0 | 0 |

607. (103)
B = $C_{10}H_7Br$
*α*-Bromo-naphthalene

| | |
|---|---|
| A | |
| 122.4 | 100.0 |
| A + AB | |
| 105.6 | 80.8 |
| AB | |
| **129.6** | **52.5** |
| 41.3 | 2.5 |

608. (103)
B = $C_{10}H_7Br$
*β*-Bromo-naphthalene

| | |
|---|---|
| A | |
| 122.4 | 100 |
| A + AB | |
| 76.2E | 66.6 |
| AB | |
| **83.5** | **52.5** |
| AB + B | |
| 50.6E | 10.4 |
| B | |
| 58.3 | 0.0 |

609. (103)
B = $C_{10}H_7Cl$
*α*-Chloro-naphthalene

| | |
|---|---|
| A | |
| 122.4 | 100.0 |
| A + AB | |
| 104.7E | 83.7 |
| AB | |
| **125.7** | **58.5** |
| 33.4 | 2.5 |

610. (103)
B = $C_{10}H_7Cl$
*β*-Chloro-naphthalene

| °C | Wt. % A |
|---|---|
| A | |
| 122.4 | 100.0 |
| A + AB | |
| 79.2 | 67.3 |
| AB | |
| **81.5** | **58.5** |
| AB + B | |
| 49.5E | 17.6 |
| B | |
| 56.7 | 0.0 |

611. (103)
B = $C_{10}H_7NO_2$
*α*-Nitronaphthalene

| | |
|---|---|
| A | |
| 122.4 | 100.0 |
| 114.7 | 95 |
| 108.2 | 90 |
| 95.0 | 80 |
| 78.6 | 70 |
| 63.3 | 60 |
| A + AB | |
| 54.7U | 52.5 |
| AB | |
| 50.9 | 40 |
| 46.5 | 30 |
| AB + B | |
| 35.7E | 17.6 |
| B | |
| 46.2 | 10 |
| 52.0 | 5 |
| 56.5 | 0 |

612. (125, 219, 406, 411)
B = $C_{10}H_8$
Naphthalene

| | |
|---|---|
| A | |
| 122.0 | 100 |
| 117.3 | 95 |
| A + AB | |
| 113.5E | 91 |
| AB | |
| 134.5 | 85 |
| 141.2 | 80 |
| 147.5 | 70 |
| **149.0** | **64.1** |
| 148.4 | 60 |
| 144.7 | 50 |
| 139.3 | 40 |
| 129.0 | 30 |
| 111.0 | 20 |
| AB + B | |
| 78.0E | 9 |
| B | |
| 79.0 | 5 |
| 80.1 | 0 |

614. (278)
B = $C_{10}H_8O$
*β*-Naphthol

614.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 122.2 | 100.0 |
| 117.0 | 95.6 |
| A + AB | |
| 111.0E | 91.0 |
| AB | |
| 118.0 | 86.4 |
| 120.2 | 85.4 |
| 146.0 | 70.2 |
| 151.0 | 62.9 |
| 156.4 | 51.4 |
| **157.0** | **50.0** |
| 150.8 | 35.2 |
| 136.4 | 23.1 |
| 127.0 | 12.4 |
| AB + B | |
| 116.0E | 6.0 |
| B | |
| 117.0 | 4.87 |
| 121.0 | 0.0 |

615. (210)
B = $C_{10}H_{14}O$
Thymol

| | |
|---|---|
| A | |
| 118.5 | 100 |
| 113.1 | 90 |
| 107.6 | 80 |
| 104.8 | 75 |
| 102.1 | 70 |
| 99.3 | 65 |
| 96.5 | 60 |
| A + AB | |
| 94.0E | 56 |
| AB | |
| **96.8** | **50** |
| 95.4 | 45 |
| 93.4 | 40 |
| 90.7 | 35 |
| 87.7 | 30 |
| 83.5 | 25 |
| 77.5 | 20 |
| 69.2 | 15 |
| 59.6 | 10 |
| AB + B | |
| 47.5E | 4.5 |
| B | |
| 49.6 | 0.0 |

616. (108, 253)
B = $C_{10}H_{16}O$
Camphor

| | |
|---|---|
| A | |
| 121.8 | 100 |
| 114.2 | 90 |
| 107.4 | 80 |
| 100.6 | 70 |
| 92.5 | 60 |
| 83.0 | 50 |
| 74.3 | 40 |
| A + B | |
| 66.4E | 30.5 |
| B | |
| 87.7 | 30 |
| 106.1 | 20 |

616.—(*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| 145.1 | 10 |
| 178.0 | 0 |

617. (234)
B = $C_{10}H_{16}O$
Fenchone

| °C | Wt. % A |
|---|---|
| A | |
| 121.3 | 100 |
| A + B | |
| 0.0E | 10 |
| B | |
| 5.3 | 0 |

618. (103)
B = $C_{12}H_8$
Acenaphthylene

| A | |
|---|---|
| 122.4 | 100.0 |
| A + AB | |
| 113.9E | 95.6 |
| AB | |
| **165.5** | **60.1** |
| AB + B | |
| 90.4E | 7.3 |
| B | |
| 93.1 | 0.0 |

619. (263)
B = $C_{12}H_9N$
Carbazole

| A | |
|---|---|
| 121.0 | 100 |
| A + AB | |
| 113.0E | 93.3 |
| AB | |
| 135.5 | 90 |
| 162.0 | 80 |
| 176.6 | 70 |
| **183.2** | **59.9** |
| AB + B | |
| 181.5 E | 49.0 |
| B | |
| 197.8 | 40 |
| 211.8 | 30 |
| 222.7 | 20 |
| 230.0 | 10 |
| 233.1 | 5 |
| 236.0 | 0 |

620. (103)
B = $C_{12}H_9NO_2$
Nitroacenaphthene

| A | |
|---|---|
| 122.4 | 100.0 |
| A + B | |
| 69.7E | 55.4 |
| B | |
| 100.9 | 0.0 |

621. (103, 239)
B = $C_{12}H_{10}$
Acenaphthene

| A | |
|---|---|
| 122.4 | 100.0 |
| 117.0 | 95 |
| A + AB | |
| **112.3E** | 90.7 |

621.—(*Continued*)

| °C | Wt. % A |
|---|---|
| AB | |
| 140.8 | 85 |
| 150.2 | 80 |
| 157.7 | 70 |
| **160.8** | **59.8** |
| 155.8 | 50 |
| 145.6 | 40 |
| 129.4 | 30 |
| 110.4 | 20 |
| 99.8 | 15 |
| AB + B | |
| 87.6E | 9.7 |
| B | |
| 92.0 | 5 |
| 95.2 | 0 |

622. (103)
B = $C_{12}H_{10}$
Diphenyl

| A | |
|---|---|
| 122.4 | 100 |
| 114.7 | 95 |
| 108.6 | 90 |
| 88.3 | 80 |
| 77.3 | 70 |
| 66.7 | 60 |
| 55.1 | 50 |
| A + B | |
| 54.1E | 38.6 |
| B | |
| 60.6 | 30 |
| 60.6 | 20 |
| 65.4 | 10 |
| 68.1 | 5 |
| 70.5 | 0 |

622.1. (274.2)
B = $C_{12}H_{10}N_2$
Azobenzene

| A | |
|---|---|
| 121.5 | 100 |
| A + B | |
| 56.0E | 32.5 |
| B | |
| 67 | 0 |

623. (138, 261)
B = $C_{12}H_{11}N$
Diphenylamine

| A | |
|---|---|
| 120.0 | 100 |
| A + AB | |
| 66.0U | 54 |
| AB + B | |
| 44.0E | 30 |
| B | |
| 53.1 | 0 |

624. (230)
B = $C_{13}H_{10}$
Fluorene

| A | |
|---|---|
| 122.0 | 100 |
| 111.2 | 90 |
| 100.0 | 80 |
| 87.2 | 70 |
| A + AB | |
| 80.0E | 65.5 |

624.—(*Continued*)

| °C | Wt. % A |
|---|---|
| AB | |
| 83.2 | 60 |
| **84.0** | **57.9** |
| 83.6 | 50 |
| AB + B | |
| 79.5E | 43.5 |
| B | |
| 82.9 | 40 |
| 92.4 | 30 |
| 100.7 | 20 |
| 108.0 | 10 |
| 112.5 | 0 |

625. (249)
B = $C_{13}H_{10}O$
Benzophenone

| A | |
|---|---|
| 121.0 | 100.0 |
| A + AB | |
| 27.2U | 37.5 |
| A + B | |
| 20.0mE | 36.0 |
| AB + B | |
| 27.0E | 29.0 |
| B | |
| 47.0 | 0.0 |

626. (103, 235)
B = $C_{13}H_{12}$
Diphenylmethane

| A | |
|---|---|
| 122.0 | 100 |
| 115.5 | 95 |
| 111.5 | 90 |
| 108.2 | 85 |
| 105.3 | 80 |
| 100.5 | 70 |
| 95.7 | 60 |
| A + $A_xB_y$ | |
| 91.0U | 53 |
| $A_xB_y$ | |
| 85.0 | 40 |
| 76.0 | 30 |
| 60.0 | 20 |
| 48.0 | 15 |
| $A_xB_y$ + B | |
| 24.5E | 10 |
| B | |
| 25.6 | 5 |
| 26.6 | 0 |

626.1. (234.1)
B = $C_{13}H_{12}O$
Benzhydrol

| A | |
|---|---|
| 121.5 | 100 |
| A + $A_2B$ | |
| 113.0E | 89.0 |
| $A_2B$ | |
| **131.0** | **72.9** |
| $A_2B$ + B | |
| 54.5E | 15 |
| B | |
| 64.5 | 0 |

627. (221)
B = $C_{14}H_{10}$
Anthracene

627.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 122.5 | 100 |
| 117.0 | 95 |
| A + AB | |
| 109.0E | 88.8 |
| AB | |
| 125.5 | 80 |
| 137.0 | 70 |
| AB + B | |
| 141.0U | 62.9 |
| B | |
| 161.6 | 50 |
| 173.6 | 40 |
| 183.8 | 30 |
| 193.7 | 20 |
| 202.8 | 10 |
| 207.3 | 5 |
| 212.0 | 0 |

628. (103)
B = $C_{14}H_{10}$
Phenanthrene

| A | |
|---|---|
| 122.4 | 100 |
| 114.1 | 95 |
| 107.4 | 90 |
| A + AB | |
| 93.8E | 81.4 |
| AB | |
| 118.5 | 70 |
| 130.7 | 60 |
| **132.8** | **56.2** |
| 128.6 | 50 |
| 116.0 | 40 |
| AB + B | |
| 81.6E | 23.5 |
| B | |
| 84.9 | 20 |
| 94.2 | 10 |
| 97.1 | 5 |
| 99.2 | 0 |

629. (103)
B = $C_{14}H_{12}$
Stilbene

| A | |
|---|---|
| 122.4 | 100 |
| 117.8 | 95 |
| 117.6 | 90 |
| 104.3 | 80 |
| 96.6 | 70 |
| A + AB | |
| 90.2E | 63.7 |
| AB + B | |
| 92.8U | 57.5 |
| B | |
| 99.2 | 50 |
| 104.7 | 40 |
| 109.2 | 30 |
| 114.4 | 20 |
| 118.8 | 10 |
| 120.4 | 5 |
| 122.2 | 0 |

630. (103)
B = $C_{14}H_{14}$
Dibenzyl

630.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 122.4 | 100.0 |
| A + B | |
| 47.1E | 18.7 |
| B | |
| 51.8 | 0.0 |

631. (103)
B = $C_{17}H_{14}$
α-Benzylnaphthalene

| A | |
|---|---|
| 122.4 | 100.0 |
| 117.9 | 95 |
| 111.8 | 90 |
| 106.3 | 85 |
| 100.7 | 80 |
| 92.0 | 70 |
| A + AB | |
| 87.5E | 65.2 |
| AB | |
| 91.8 | 60 |
| **97.0** | **51.2** |
| 91.8 | 40 |
| 79.1 | 30 |
| 60.4 | 20 |
| AB + B | |
| 37.8E | 8.5 |
| B | |
| 44.1 | 5 |
| 51.3 | 0 |

632. (103)
B = $C_{18}H_{18}$
Retene

| A | |
|---|---|
| 122.4 | 100 |
| 117.5 | 95 |
| 114.0 | 90 |
| 105.3 | 80 |
| A + AB | |
| 100.7E | 74.7 |
| AB | |
| 105.6 | 70 |
| 115.6 | 60 |
| **120.9** | **50.6** |
| 108.5 | 40 |
| 88.4 | 30 |
| AB + B | |
| 60.1E | 79.8 |
| B | |
| 82.5 | 10 |
| 90.0 | 5 |
| 95.2 | 0 |

633. (14)
B = $C_{19}H_{13}N$
5-Phenylacridine

| °C | Mol % A |
|---|---|
| A | |
| 120.3 | 100.0 |
| A + $A_2B$ | |
| 118.8E | 97.0 |
| $A_2B$ + AB | |
| 176.0U | 70.0 |

633.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB | |
| **227.7** | **50.0** |
| AB + B | |
| 169.4 | 22.0 |
| B | |
| 181.9 | 0.0 |

634. (103, 254)
B = $C_{19}H_{16}$
Triphenylmethane

| °C | Wt. % A |
|---|---|
| A | |
| 122.0 | 100.0 |
| Immiscible | |
| 113.5 | 92–30 |
| A + B | |
| 86.0E | 10 |
| B | |
| 92.0 | 0 |

635. (243)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| A | |
|---|---|
| 122.0 | 100 |
| 120.0 | 95 |
| 117.6 | 90 |
| 112.1 | 80 |
| A + AB | |
| 110E | 77 |
| AB | |
| 118.8 | 70 |
| 129.9 | 60 |
| 137.5 | 50 |
| **138.5** | **46.8** |
| 133.6 | 40 |
| AB + B | |
| 122E | 34 |
| B | |
| 141.0 | 20 |
| 150.5 | 10 |
| 154.8 | 5 |
| 159.0 | 0 |

*v. also* 270, 319, 439, 458.1, 459, 526, 553, 1860

$C_6H_3N_3O_8$
Styphnic acid
635.1. (444.1)
B = $C_6H_{10}O_4$
Glycol diacetate

| °C | g A per 100 cc B |
|---|---|
| 20–25 | 15.0 |

636. (110)
B = $C_7H_5N_3O_6$
2, 4, 6-Trinitrotoluene

| °C | Wt. % A |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + B | |
| 67.5 | 19.3 |
| B | |
| 78.8 | 0.0 |

**$C_6H_3N_3O_8$.—(*Continued*)**

637. (110)
B = $C_8H_7N_3O_6$
2, 4, 6-Trinitro-*m*-xylene

| °C | Wt. % A |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + B | |
| 141.0E | 61.8 |
| B | |
| 180.2 | 0.0 |

638. (110)
B = $C_{10}H_7Br$
*α*-Bromonaphthalene

| | |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + AB | |
| 101.2U | 43.0 |
| AB + B | |
| 6.2E | 0.5 |
| B | |
| 6.4 | 0.0 |

639. (110)
B = $C_{10}H_7Br$
*β*-Bromonaphthalene

| | |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + AB | |
| 131.7U | 50.0 |
| AB + B | |
| 56.9E | 2.2 |
| B | |
| 58.3 | 0.0 |

640. (110)
B = $C_{10}H_7Cl$
*α*-Chloronaphthalene

| | |
|---|---|
| A | |
| 175.5 | 100 |
| A + AB | |
| 109.8U | 47.5 |

641. (110)
B = $C_{10}H_7NO_2$
*α*-Nitronaphthalene

| | |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + B | |
| 45.2E | 15.7 |
| B | |
| 56.5 | 0.0 |

642. (110)
B = $C_{10}H_8$
Naphthalene

| | |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + AB | |
| 148.8E | 86.4 |
| AB | |
| **165.5** | **65.7** |

642.—(*Continued*)

| °C | Wt. % A |
|---|---|
| AB + B | |
| 79.2 | 4.3 |
| B | |
| 80.0 | 0.0 |

643. (108)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + B | |
| 82.6E | 25.3 |
| B | |
| 178.0 | 0.0 |

644. (110)
B = $C_{12}H_9NO_2$
Nitroacenaphthene

| °C | Wt. % A |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + B | |
| 80.3E | 52.3 |
| B | |
| 100.9 | 0.0 |

645. (110)
B = $C_{12}H_{10}$
Acenaphthene

| | |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + AB | |
| 136.1E | 78.3 |
| AB | |
| **156.0** | **61.4** |
| AB + B | |
| 89.5E | 10.7 |
| B | |
| 96.2 | 0.0 |

646. (110)
B = $C_{12}H_{10}$
Diphenyl

| | |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + B | |
| 61.5E | 16.6 |
| B | |
| 70.5 | 0.0 |

647. (110)
B = $C_{13}H_{10}$
Fluorene

| | |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + AB | |
| 127.5U | 52.5 |
| AB + B | |
| 97.1E | 24.4 |
| B | |
| 112.3 | 0.0 |

648. (110)
B = $C_{13}H_{12}$
Diphenylmethane

| | |
|---|---|
| A | |
| 175.5 | 100.0 |
| 144.6 | 59.8–43.0 |

648.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A + B | |
| 22.6E | 2.5 |
| B | |
| 26.6 | 0.0 |

649. (110)
B = $C_{14}H_{10}$
Anthracene

| | |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + AB | |
| 151.4E | 84.5 |
| AB | |
| **176.3** | **56.5** |
| AB + B | |
| 170.1E | 45.4 |
| B | |
| 213.0 | 0.0 |

650. (110)
B = $C_{14}H_{10}$
Phenanthrene

| | |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + AB | |
| 125.6E | 70.7 |
| AB | |
| **132.7** | **56.5** |
| AB + B | |
| 85.7E | 18.3 |
| B | |
| 99.2 | 0.0 |

651. (110)
B = $C_{14}H_{12}$
Stilbene

| | |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + AB | |
| 142.4U | 55 |
| AB | |
| 114.6E | 19.2 |
| B | |
| 122.5 | 0.0 |

652. (110)
B = $C_{14}H_{14}$
Dibenzyl

| | |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + B | |
| 50.7E | 6.4 |
| B | |
| 51.8 | 0.0 |

653. (110)
B = $C_{17}H_{14}$
*α*-Benzylnaphthalene

| | |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + AB | |
| 134.3U | 52.9 |
| AB + B | |
| 47.5E | 1.8 |
| B | |
| 51.3 | 0.0 |

654. (110)
B = $C_{18}H_{18}$
Retene

| °C | Wt. % A |
|---|---|
| A | |
| 175.5 | 100.0 |
| A + AB | |
| 125.6E | 66.4 |
| AB | |
| **135.7** | **51.1** |
| AB + B | |
| 76.2E | 16.6 |
| B | |
| 95.2 | 0.0 |

655. (110)
B = $C_{19}H_{16}$
Triphenylmethane

| | |
|---|---|
| A | |
| 175.5 | 100.0 |
| 167.4 | 85.5 to 49.5 |
| A + B | |
| 94.2E | 4.0 |
| B | |
| 92.2 | 0.0 |

*v. also* 554

**$C_6H_3N_4O_8$**
Tetranitroaniline

655.1. (444.1)
B = $C_6H_{10}O_4$
Glycol diacetate

| °C | g A per 100 g B |
|---|---|
| 25.0 | 2.39 |

**$C_6H_4BrCl$**
*o*-Bromochlorobenzene

656. *v.* p. 175
B = $C_6H_4BrCl$
*p*-Bromochlorobenzene
*v. also* 1854

**$C_6H_4BrCl$**
*p*-Bromochlorobenzene

657. (59, 60)
B = $C_6H_4Br_2$
*p*-Dibromobenzene

| °C | Mol % A |
|---|---|
| Mix. | |
| 67.0 | 100.0 |
| 70.0 | 84.3 |
| 72.5 | 72.0 |
| 75.0 | 59.3 |
| 77.5 | 47.0 |
| 80.0 | 34.5 |
| 82.5 | 22.0 |
| 85 | 9.2 |
| 87.1 | 0.0 |

*v. also* 1855

658. (59, 60)
B = $C_6H_4Cl_2$
*p*-Dichlorobenzene

658.—(*Continued*)

| °C | Mol % A |
|---|---|
| Mix. | |
| 67.0 | 100 |
| 65.0 | 86.0 |
| 62.5 | 70.0 |
| 60.0 | 59.0 |
| 57.5 | 48.0 |
| 55.0 | 34.0 |
| 52.6† | 2.5 |
| 52.8 | 0.0 |

*v. also* 656, 1854, 1855

**$C_6H_4BrI$**
*p*-Bromoiodobenzene

659. (349)
B = $C_6H_4Br_2$
*p*-Dibromobenzene

| Mix. | |
|---|---|
| 89.9 | 100 |
| 88.8 | 90 |
| 87.4 | 80 |
| 86.5 | 70 |
| 86.0 | 60 |
| 85.4 | 50 |
| 85.1 | 40 |
| 85.1† | 35 |
| 85.1 | 30 |
| 85.4 | 20 |
| 86.3 | 10 |
| 87.1 | 0 |

660. (349)
B = $C_6H_4I_2$
*p*-Diiodobenzene

| Mix. | |
|---|---|
| 89.9 | 100 |
| 90.4 | 95 |
| 91.6 | 90 |
| 95.6 | 80 |
| 100.5 | 70 |
| 106.0 | 60 |
| 111.0 | 50 |
| 115.5 | 40 |
| 119.7 | 30 |
| 123.0 | 20 |
| 125.5 | 10 |
| 128.0 | 0 |

**$C_6H_4BrNO_2$**
*o*-Bromonitrobenzene

661. *v.* p. 175
B = $C_6H_4BrNO_2$
*m*-Bromonitrobenzene

662. *v.* p. 175
B = $C_6H_4BrNO_2$
*p*-Bromonitrobenzene

663. (227)
B = $C_6H_4ClNO_2$
*o*-Chloronitrobenzene

663.—(*Continued*)

| °C | Mol % A |
|---|---|
| Mix. | |
| $t_L$ | $t_S$ |
| 34.2 | 34.2 | 100 |
| 33.6 | | 90 |
| 33.2 | 33.0 | 80 |
| 32.7 | | 70 |
| 32.2 | 32.0 | 60 |
| 32.1 | | 50 |
| 32.0 | | 40 |
| 31.9 | | 30 |
| 31.8† | 31.8† | 20 |
| 31.9 | | 10 |
| 32.0 | 32.0 | 0 |

664. *v.* p. 175
B = $C_6H_6$

**$C_6H_4BrNO_2$**
*m*-Bromonitrobenzene

665. *v.* p. 175
B = $C_6H_4BrNO_2$
*p*-Bromonitrobenzene

666. (150, 238)
B = $C_6H_4ClNO_2$
*m*-Chloronitrobenzene

| Mix. | | |
|---|---|---|
| 54.0 | 54.0 | 100 |
| 53.2 | 53.1 | 95 |
| 52.5 | 52.3 | 90 |
| 51.1 | 50.7 | 80 |
| 49.5 | 49.0 | 70 |
| 48.25 | 47.8 | 60 |
| 47.4 | 47.0 | 50 |
| 46.7 | 46.3 | 40 |
| 46.0 | 45.7 | 30 |
| 45.5 | 45.3 | 20 |
| 45.0 | 44.9 | 10 |
| 44.8 | 44.7 | 5 |
| 44.6 | 44.6 | 0 |

667. (150)
B = $C_6H_4FNO_2$
*m*-Fluoronitrobenzene

| Mix. | | |
|---|---|---|
| 54.0 | 54.0 | 100 |
| 52.0 | 46.0 | 95 |
| 50.0 | 38.0 | 90 |
| 45.2 | 24.5 | 80 |
| 39.7 | 15.0 | 70 |
| 32.8 | 9.5 | 60 |
| 24.8 | 5.7 | 50 |
| 17.0 | +2.5 | 40 |
| +8.5 | 0.0 | 30 |
| 0.0 | −2.5 | 20 |
| −4.4† | −4.4† | 9 |
| 0.0 | −3.5 | 5 |
| +4.1 | +4.1 | 0 |

668. (150)
B = $C_6H_4INO_2$
*m*-Iodonitrobenzene

| °C | | Wt. % A |
|---|---|---|
| Mix. | | |
| $t_L$ | $t_S$ | |
| 54.0 | | 100 |
| 53.0 | 52.3 | 95 |
| 52.0 | 50.7 | 90 |
| 49.8 | 48.0 | 80 |
| 47.4 | 45.5 | 70 |
| 44.8 | 43.0 | 60 |
| 42.4 | 40.5 | 50 |
| 39.9 | 38.0 | 40 |
| 37.3 | 35.4 | 30 |
| 34.5 | 33.0 | 20 |
| 32.3† | 32.3† | 12.5 |
| 33.5 | 32.5 | 5 |
| 34.6 | 34.6 | 0 |

669. *v.* p. 175
B = $C_6H_6$

*v. also* 661

**$C_6H_4BrNO_2$**
*p*-Bromonitrobenzene
670. (227)
B = $C_6H_4ClNO_2$
*p*-Chloronitrobenzene

| °C | | Mol % A |
|---|---|---|
| A | | |
| $t_L$ | $t_S$ | |
| 123.0 | 123.0 | 100 |
| A + Mixed crystals | | |
| 118.6 | 116.5 | 90 |
| 114.3 | 111.0 | 80 |
| 110.0 | 106.3 | 70 |
| 105.4 | 101.5 | 60 |
| 100.4 | 97.0 | 50 |
| 95.0 | 92.0 | 40 |
| 89.5 | 87.0 | 30 |
| B + Mixed crystals | | |
| 84.6 | 83.0 | 20 |
| 83.7 | 82.0 | 10 |
| B | | |
| 82.0 | 82.0 | 0 |

671. *v.* p. 175
B = $C_6H_6$

*v. also* 662, 665

**$C_6H_4Br_2$**
*o*-Dibromobenzene
672. *v.* p. 175
B = $C_6H_4Br_2$
*p*-Dibromobenzene

*v. also* 1856

**$C_6H_4Br_2$**
*p*-Dibromobenzene
673. *v.* p. 175

B = $C_6H_4ClNO_2$
*m*-Chloronitrobenzene

674. (379.5)
B = $C_6H_4ClNO_2$
*p*-Chloronitrobenzene

| °C | Wt. % A |
|---|---|
| A | |
| 86.4 | 100.0 |
| A + AB | |
| 75.0E | 75.0 |
| AB | |
| **78.1** | **59.9** |
| AB + B | |
| 77.1E | 30.0 |
| B | |
| 82.4 | 0.0 |

675. (59, 60)
B = $C_6H_4Cl_2$
*p*-Dichlorobenzene

| °C | | Mol % A |
|---|---|---|
| Mix. | | |
| $t_L$ | $t_S$ | |
| 87.1 | 87.1 | 100 |
| 85.4 | 77.5 | 95 |
| 83.7 | 72.0 | 90 |
| 80.0 | 66.0 | 80 |
| 76.0 | 62.5 | 70 |
| 72.0 | 60.1 | 60 |
| 67.3 | 58.4 | 50 |
| 62.9 | 57.1 | 40 |
| 59.1 | 56.0 | 30 |
| 55.8 | 54.8 | 20 |
| 53.8 | 53.7 | 10 |
| 52.8 | 52.8 | 0 |

*v. also* 1855

676. (349)
B = $C_6H_4I_2$
*p*-Diiodobenzene

| | | |
|---|---|---|
| A | | |
| 87.1 | 87.1 | 100 |
| 83.0 | | 90 |
| 81.1 | | 80 |
| A + B | | |
| 80.0 | | 69 |
| B | | |
| 90.5 | 80.0 | 60 |
| 99.7 | 80.0 | 50 |
| 107.0 | 80.0 | 40 |
| 113.0 | | 30 |
| 118.5 | | 20 |
| 123.6 | | 10 |
| 128.0 | | 0 |

Solid B soluble in solid A, but solid A insoluble in solid B

677. *v.* p. 175
B = $C_6H_5Br$
Bromobenzene

678. *v.* p. 175
B = $C_6H_5NO_2$
Nitrobenzene

679. *v.* p. 175
B = $C_6H_6$

680. *v.* p. 175
B = $C_6H_7N$
Aniline

681. (49)
B = $C_7H_7Br$
*p*-Bromotoluene

| °C | Wt. % A |
|---|---|
| A | |
| 87.05 | 100.0 |
| 85.9 | 98.6 |
| 82.9 | 95.7 |
| 79.6 | 89.9 |
| 74.8 | 82.2 |
| 69.5 | 75.4 |
| 60.1 | 65.0 |
| 52.3 | 55.0 |
| 40.7 | 43.0 |
| 38.5 | 41.0 |
| 37.4 | 39.2 |
| A + mixed crystals | |
| 38.5U | 36.7 |

| °C | | Wt. % A |
|---|---|---|
| B + mixed crystals | | |
| $t_L$ | $t_S$ | |
| 36.4 | 36.2 | 36.8 |
| 34.4 | 34.1 | 33.2 |
| 32.8 | 30.4 | 22.9 |
| 30.7 | 27.8 | 15.0 |
| 28.6 | 27.7 | 7.3 |
| 28.0 | 27.6 | 5.0 |
| B | | |
| 26.5 | | 0.0 |

682. *v.* p. 175
B = $C_7H_8$

683. (100)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 87.1 | 100 |
| A + B | |
| 40.0E | 40.5 |
| B | |
| 178.0 | 0.0 |

*v. also* 7, 22, 320, 403, 472, 496, 657, 659, 672, 1855, 1856

**$C_6H_4Br_2ClN$**
2-Chloro-4, 6-dibromoaniline
684. (440)
B = $C_6H_4Br_3N$
2, 4, 6-Tribromoaniline

| °C | Mol % A |
|---|---|
| Mix. | |
| 98.0 | 100 |
| 102.8 | 80 |
| 109.0 | 50 |
| 115.3 | 20 |
| 119.5 | 0 |

**$C_6H_4Br_3N$**
2, 4, 6-Tribromoaniline
*v.* 684

**$C_6H_4ClI$**
*p*-Chloroiodobenzene
685. (349)
B = $C_6H_4Cl_2$
*p*-Dichlorobenzene

| °C | | Mol % A |
|---|---|---|
| Mix. | | |
| $t_L$ | $t_S$ | |
| 53.0 | 53.0 | 100 |
| 50.5 | 50.0 | 90 |
| 48.0 | 47.0 | 80 |
| 45.0 | 44.0 | 70 |
| 42.5 | 42.1 | 60 |
| 41.0 | 41.0 | 50 |
| 41.0† | 41.0† | 45 |
| 41.0 | 41.0 | 40 |
| 42.9 | 41.5 | 30 |
| 46.5 | 43.6 | 20 |
| 50.2 | 48.0 | 10 |
| 52.8 | 52.8 | 0 |

686. (349)
B = $C_6H_4I_2$
*p*-Diiodobenzene

| | | |
|---|---|---|
| Mix. | | |
| 53.0 | | 100 |
| 57.0 | | 95 |
| 58.5 | | 90 |
| Two series mixed crystals | | |
| 59.0U | 59.0 | 85.5 |
| 66.5 | 59.0 | 80 |
| 78.5 | 59.0 | 70 |
| 88.7 | 59.0 | 60 |
| 97.4 | 59.0 | 50 |
| 105.0 | 59.0 | 40 |
| 111.3 | 59.0 | 30 |
| 117.2 | 59.0 | 20 |
| 122.5 | | 10 |
| 128.0 | | 0 |
| Immiscibility range 22 to 86 Mol % B | | |

**$C_6H_4ClNO_2$**
*o*-Chloronitrobenzene
687. *v.* p. 175
B = $C_6H_4ClNO_2$
*p*-Chloronitrobenzene

688. *v.* p. 175
B = $C_6H_6$

689. (225)
B = $C_6H_7N$
Aniline

| °C | Mol % A |
|---|---|
| A | |
| 32.0 | 100.0 |
| 27.0 | 88.7 |

689.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 20.7 | 75.3 |
| 14.5 | 63.3 |
| 9.0 | 55.8 |
| + 2.0 | 45.2 |
| − 3.0 | 38.5 |
| −12.0 | 30.1 |
| −17.0 | 24.7 |
| A + B | |
| −19E | 23 |
| B | |
| −17.0 | 19.9 |
| −13.5 | 14.7 |
| −11.0 | 9.7 |
| − 7.8 | 4.4 |
| − 5.5 | 0.0 |

690. (101)
B = $C_{10}H_{16}O$
Camphor

| | |
|---|---|
| A | |
| 31.5 | 100.0 |
| A + B | |
| 2.6E | 41.5 |
| B | |
| 178.0 | 0.0 |

*v. also* 60, 663

**$C_6H_4ClNO_2$**
*m*-Chloronitrobenzene
691. (150)
B = $C_6H_4FNO_2$
*m*-Fluoronitrobenzene

| °C | | Mol % A |
|---|---|---|
| Mix. | | |
| $t_L$ | $t_S$ | |
| 44.6 | 44.6 | 100 |
| 43.2 | 36.0 | 95 |
| 41.6 | 28.0 | 90 |
| 38.1 | 15.0 | 80 |
| 33.8 | 8.5 | 70 |
| 27.5 | 5.0 | 60 |
| 20.0 | 3.0 | 50 |
| 13.0 | 1.5 | 40 |
| 6.7 | +0.5 | 30 |
| +1.0 | −0.3 | 20 |
| −0.7† | −0.7† | 15 |
| +0.4 | −0.2 | 10 |
| 2.5 | +1.5 | 5 |
| 4.1 | 4.1 | 0 |

692. (150)
B = $C_6H_4INO_2$
*m*-Iodonitrobenzene

| °C | | Wt. % A |
|---|---|---|
| Mix. | | |
| $t_L$ | $t_S$ | |
| 44.6 | 44.6 | 100 |
| 43.5 | 42.0 | 95 |
| 42.5 | 40.0 | 90 |

692.—(*Continued*)

| °C | | Wt. % A |
|---|---|---|
| Mix. | | |
| $t_L$ | $t_S$ | |
| 40.5 | 37.0 | 80 |
| 38.5 | 35.0 | 70 |
| 36.3 | 33.3 | 60 |
| 33.4 | 31.5 | 50 |
| 30.8 | 30.0 | 40 |
| 29.1 | 29.1 | 30 |
| 28.4† | 28.4† | 17 |
| 29.7 | 29.2 | 10 |
| 31.7 | 30.8 | 5 |
| 34.6 | 34.6 | 0 |

693. *v.* p. 175
B = $C_6H_6$

694. (259)
B = $C_6H_7N$
Aniline

| °C | Mol % A |
|---|---|
| A | |
| 43.0 | 100.0 |
| 39.5 | 88.6 |
| 32.0 | 72.0 |
| 23.0 | 54.6 |
| 13.0 | 39.8 |
| 3.0 | 27.7 |
| + 0.3 | 24.7 |
| − 4.0 | 19.3 |
| A + B | |
| −12.0E | 12.4 |
| B | |
| − 8.2 | 5.7 |
| − 6.3 | 0.0 |

695. (259)
B = $C_{10}H_8$
Naphthalene

| | |
|---|---|
| A | |
| 43.5 | 100.0 |
| 37.3 | 84.4 |
| A + B | |
| 23.0E | 64.5 |
| B | |
| 33.5 | 55.9 |
| 46.5 | 43.4 |
| 60.0 | 28.7 |
| 70.5 | 13.9 |
| 80.5 | 0.0 |

696. (101)
B = $C_{10}H_{16}O$
Camphor

| | |
|---|---|
| A | |
| 43.9 | 100.0 |
| A + B | |
| 11.5E | 43.6 |
| B | |
| 178.0 | 0.0 |

*v. also* 666, 673

**$C_6H_4ClNO_2$**
*p*-Chloronitrobenzene
697. *v.* p. 175
B = $C_6H_6$

**$C_6H_4ClNO_2$.—(*Continued*)**

698. (259)
B = $C_6H_7N$
Aniline

| °C | Mol % A |
|---|---|
| A | |
| 82.5 | 100.0 |
| 77.0 | 88.6 |
| 62.0 | 67.2 |
| 46 5 | 50.5 |
| 29 5 | 36.9 |
| +10.0 | 26.7 |
| A + B | |
| −15.0E | 19.0 |
| B | |
| −12.6 | 13.0 |
| − 6.3 | 0.0 |

699. (259)
B = $C_{10}H_8$
Naphthalene

| | |
|---|---|
| A | |
| 80.5 | 100.0 |
| 71.0 | 82.1 |
| 53.0 | 59.6 |
| 43.8 | 51.6 |
| A + B | |
| 40E *ca.* | *ca.* 49 |
| B | |
| 49.0 | 39.6 |
| 63.0 | 24.0 |
| 71.0 | 13.9 |
| 80.0 | 0.0 |

700. (453)
B = $C_{12}H_{11}N$
Diphenylamine

| | |
|---|---|
| A | |
| 82.5 | 100.0 |
| A + B | |
| 27.0E | 42.5 |
| B | |
| 54.2 | 0.0 |

*v. also* 670, 674, 687

**$C_6H_4Cl_2$**
*o*-Dichlorobenzene
701. *v.* p. 175
B = $C_6H_4Cl_2$
*p*-Dichlorobenzene
*v. also* 1857

**$C_6H_4Cl_2$**
*p*-Dichlorobenzene
702. (349)
B = $C_6H_4I_2$
*p*-Diiodobenzene

| °C | Mol % A |
|---|---|
| A | |
| 52.7 | 100 |
| 50.5 | 95 |
| 47.5 | 90 |
| A + B | |
| 45.0E | 86 |

**702.—(*Continued*)**

| °C | Mol % A |
|---|---|
| B | |
| 57.8 | 80 |
| 75.5 | 70 |
| 86.7 | 60 |
| 95.5 | 50 |
| 102.5 | 40 |
| 110.0 | 30 |
| 116.0 | 20 |
| 121.3 | 10 |
| 128.0 | 0 |

*v. also* 658, 675, 685, 701, 1855, 1857

**$C_6H_4Cl_2O_4S_2$**
*m*-Benzene-disulfonyl chloride
703. *v.* p. 175
B = $C_6H_4Cl_2O_4S_2$
*p*-Benzene-disulfonyl chloride

704. (308)
B = $C_7H_4Cl_2O_3S$
*sym*-Chloride of *m*-sulfobenzoic acid

| °C | Mol % A |
|---|---|
| 20.4 | 0 |
| 12.9 | 10 |
| 9.0 | 15 |

*v. also* 1858

**$C_6H_4Cl_2O_4S_2$**
*p*-Benzene-disulfonyl chloride
705. (308)
B = $C_7H_4Cl_2O_3S$
*sym*-Chloride of *p*-sulfobenzoic acid

| | |
|---|---|
| 20.4 | 0 |
| 14.6 | 8.2 |

*v. also* 703, 1859

**$C_6H_4FNO_2$**
*o*-Fluoronitro-benzene
706. (166)
B = $C_6H_4FNO_2$
*p*-Fluoronitro-benzene

| °C | % A |
|---|---|
| A | |
| − 8.0 | 100.0 |
| B | |
| +18.1 | 13.0 |
| 23.5 | 4.9 |
| 26.4 | 0.0 |

**$C_6H_4FNO_2$**
*m*-Fluoronitro-benzene
*v.* 667, 691

**$C_6H_4FNO_2$**
*p*-Fluoronitro-benzene
*v.* 552, 706

**$C_6H_4INO_2$**
*o*-Iodonitrobenzene
707. *v.* p. 175
B = $C_6H_4INO_2$
*p*-Iodonitrobenzene

**$C_6H_4INO_2$**
*m*-Iodonitrobenzene
*v.* 668, 692

**$C_6H_4I_2$**
*p*-Diiodobenzene
*v.* 660, 676, 686, 702

**$C_6H_4N_2O_4$**
*o*-Dinitrobenzene
708. *v.* p. 175
B = $C_6H_4N_2O_4$
*m*-Dinitrobenzene

709. *v.* p. 175
B = $C_6H_6$

710. (259)
B = $C_6H_7N$
Aniline

| °C | Mol % A |
|---|---|
| A | |
| 116.5 | 100.0 |
| 108.0 | 82.9 |
| 92.0 | 64.2 |
| 73.0 | 44.5 |
| 54.0 | 29.0 |
| 37.0 | 19.8 |
| +12.0 | 9.7 |
| A + B | |
| −11.0E | *ca.* 4.8 |
| B | |
| − 8.5 | 3.5 |
| − 5.5 | 0.0 |

711. (247)
B = $C_6H_7NO$
*m*-Aminophenol

| °C | Wt. % A |
|---|---|
| A | |
| 115.7 | 100.0 |
| A + B | |
| 89.0E | 55.0 |
| B | |
| 118.0 | 0.0 |

712. (264)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| | |
|---|---|
| A | |
| 115.0 | 100.0 |
| A + B | |
| 74.1E | 48.0 |
| B | |
| 99.8 | 0.0 |

713. (264)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| | |
|---|---|
| A | |
| 115.0 | 100.0 |

**713.—(*Continued*)**

| °C | Wt. % A |
|---|---|
| A + B | |
| 42.0E | 26.0 |
| B | |
| 62.0 | 0.0 |

714. *v.* p. 175
B = $C_7H_5N_3O_6$
2, 4, 6-Trinitro-toluene

716. *v.* p. 175
B = $C_7H_6N_2O_4$
2, 4-Dinitrotoluene

717. (258)
B = $C_7H_6O_2$
*m*-Hydroxy-benzaldehyde

| °C | Wt. % A |
|---|---|
| A | |
| 115.0 | 100.0 |
| A + B | |
| 84.0E | 44.0 |
| B | |
| 105.0 | 0.0 |

718. (256)
B = $C_7H_9N$
*p*-Toluidine

| | |
|---|---|
| A | |
| 114.8 | 100.0 |
| A + B | |
| 31.5E | 26.0 |
| B | |
| 42.5 | 0.0 |

719. *v.* p. 176
B = $C_{10}H_8$
Naphthalene

720. *v.* p. 176
B = $C_{10}H_9N$
*α*-Naphthylamine

721. *v.* p. 176
B = $C_{10}H_9N$
*β*-Naphthylamine

722. (265)
B = $C_{12}H_9N$
Carbazole

| °C | Wt. % A |
|---|---|
| A | |
| 116.5 | 100 |
| 111.0 | 90 |
| A + B | |
| 107.0E | 85 |
| B | |
| 125.0 | 80 |
| 153.3 | 70 |
| 174.3 | 60 |
| 190.1 | 50 |
| 203.0 | 40 |
| 214.1 | 30 |
| 223.2 | 20 |
| 230.5 | 10 |
| 236.0 | 0 |

723. *v.* p. 176
B = $C_{12}H_{10}$
Acenaphthene

724. *v.* p. 176
B = $C_{13}H_{10}$
Fluorene

725. (252)
B = $C_{14}H_{10}$
Anthracene

| °C | Wt. % A |
|---|---|
| A | |
| 116.5 | 100 |
| A + B | |
| 110.0E | 87.5 |
| B | |
| 130.0 | 80 |
| 149.5 | 70 |
| 162.6 | 60 |
| 174.3 | 50 |
| 183.9 | 40 |
| 192.5 | 30 |
| 200.1 | 20 |
| 206.5 | 10 |
| 212.5 | 0 |

726. *v.* p. 176
B = $C_{14}H_{10}$
Phenanthrene

727. (243)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| A | |
| 116.5 | 100.0 |
| A + B | |
| 102.0E | 67.0 |
| B | |
| 159.5 | 0.0 |

*v. also* 73, 555

**$C_6H_4N_2O_4$**
*m*-Dinitrobenzene
728.
B = $C_6H_5Br$
Bromobenzene
*v.* Seidell, p. 131

729. (430)
B = $C_6H_5NO_2$
Nitrobenzene

| °C | Wt. % B |
|---|---|
| 5.22 | 100 |
| 4.35 | 98 |
| 3.42 | 96 |
| 2.41 | 94 |
| 1.47 | 92 |
| 0.55 | 90 |

730. *v.* p. 176
B = $C_6H_6$

732. (82)
B = $C_6H_6N_2O_2$
*m*-Nitroaniline

| °C | Mol % A |
|---|---|
| A | |
| 90.2 | 100.0 |
| 83.7 | 90.0 |
| 76.1 | 70.0 |
| 63.3 | 65.0 |
| A + B | |
| 60.0E | 61.5 |

**732.—(*Continued*)**

| °C | Mol % A |
|---|---|
| B | |
| 62.5 | 60.0 |
| 69.6 | 55.0 |
| 73.5 | 50.0 |
| 78.0 | 45.0 |
| 83.6 | 40.0 |
| 93.5 | 30.0 |
| 100.5 | 20.0 |
| 107.5 | 10.0 |
| 114.0 | 0.0 |

733. (222)
B = $C_6H_7N$
Aniline

| | |
|---|---|
| A | |
| 91.0 | 100.0 |
| 85.5 | 91.1 |
| 80.0 | 81.8 |
| 65.0 | 66.0 |
| 53.0 | 54.6 |
| A + AB | |
| 41.5U | 46.2 |
| AB | |
| 39.0 | 39.0 |
| 37.0 | 31.8 |
| 26.5 | 20.8 |
| +14.0 | 13.3 |
| − 2.0 | 6.6 |
| AB + B | |
| − 8.0E | 4.2 |
| B | |
| − 6.0 | 1.5 |
| − 5.5 | 0.0 |

734. (247)
B = $C_6H_7NO$
*m*-Aminophenol

| °C | Wt. % A |
|---|---|
| A | |
| 89.0 | 100.0 |
| A + B | |
| 74.5E | 77.0 |
| B | |
| 118.0 | 0.0 |

735. (264)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| | |
|---|---|
| A | |
| 89.0 | 100.0 |
| A + $A_3B_2$ | |
| 58.0E | 71 |
| $A_3B_2$ | |
| **58.0** | **70.0** |
| $A_3B_2$ + B | |
| 58.0E | 65 |
| B | |
| 99.8 | 0.0 |

736. (264)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| | |
|---|---|
| A | |
| 89.0 | 100.0 |
| A + $AB_2$ | |
| 36E | 50 |

736.—(*Continued*)

| °C | Wt. % A |
|---|---|
| | $AB_2$ |
| **36** | **43.8** |
| | $AB_2$ + B |
| 36E | 40 |
| | B |
| 61.9 | 0 |

737. (264)
B = $C_6H_8N_2$
*p*-Phenylenediamine

| °C | Wt. % A |
|---|---|
| | A |
| 89.0 | 100.0 |
| | A + B |
| 74.0E | 78.0 |
| | B |
| 138.0 | 0.0 |

738. *v.* p. 176
B = $C_7H_5N_3O_6$
2, 4, 6-Trinitrotoluene

739. *v.* p. 176
B = $C_7H_6N_2O_4$
2, 4-Dinitrotoluene

740. (258)
B = $C_7H_6O_2$
*m*-Hydroxybenzaldehyde

| °C | Wt. % A |
|---|---|
| | A |
| 87.5 | 100.0 |
| | A + B |
| 63.0E | 66.0 |
| | B |
| 105.0 | 0.0 |

741. *v.* p. 176
B = $C_7H_7NO_2$
*p*-Nitrotoluene

742. (256)
B = $C_7H_9N$
*p*-Toluidine

| °C | Wt. % A |
|---|---|
| | A |
| 89.0 | 100.0 |
| | A + B |
| 16.0E | 48.5 |
| | B |
| 42.5 | 0.0 |

743. *v.* p. 176
B = $C_8H_9NO$
Acetanilide

744. (222, 354)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % A |
|---|---|
| | A |
| 87.5 | 100 |
| 84.2 | 95 |
| 80.8 | 90 |
| 73.3 | 80 |
| 64.5 | 70 |
| | A + AB |
| 50.5E | 58 |

744.—(*Continued*)

| °C | Mol % A |
|---|---|
| | AB |
| **50.8** | **50** |
| | AB + B |
| 50.3E | 40 |
| | B |
| 59.6 | 30 |
| 67.3 | 20 |
| 74.2 | 10 |
| 77.3 | 5 |
| 80.1 | 0 |

745. (237)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Wt. % A |
|---|---|
| | A |
| 90.0 | 100 |
| 81.0 | 90 |
| 71.0 | 80 |
| | A + AB |
| 57.0E | 69.0 |
| | AB |
| 63.2 | 60 |
| **63.8** | **54** |
| 63.6 | 50 |
| 58.7 | 40 |
| 47.5 | 30 |
| | AB + B |
| 33.0E | 20.5 |
| | B |
| 41.8 | 10 |
| 48.0 | 0 |

746. (237)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| | A |
| 90.0 | 100.0 |
| 82.2 | 90 |
| 72.0 | 80 |
| 60.0 | 70 |
| | A + AB |
| 51.8E | 63.8 |
| | AB + B |
| 53.2U | 56 |
| | B |
| 65.0 | 50 |
| 80.0 | 40 |
| 90.5 | 30 |
| 97.5 | 20 |
| 103.5 | 10 |
| 109.0 | 0 |

747. (101)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| | A |
| 90.1 | 100.0 |
| | A + B |
| 50.5E | 38.5 |
| | B |
| 178.0 | 0.0 |

748. (265)
B = $C_{12}H_9N$
Carbazole

748.—(*Continued*)

| °C | Wt. % A |
|---|---|
| | A |
| 88.0 | 100 |
| 76.0 | 90 |
| | A + B |
| 72.0E | 87 |
| | B |
| 104.5 | 80 |
| 137.5 | 70 |
| 162.0 | 60 |
| 182.0 | 50 |
| 198.0 | 40 |
| 211.0 | 30 |
| 221.5 | 20 |
| 230.0 | 10 |
| 236.0 | 0 |

749. (132, 239)
B = $C_{12}H_{10}$
Acenaphthene

| | |
|---|---|
| | A |
| 89.4 | 100 |
| 85.7 | 95 |
| 82.0 | 90 |
| 74.3 | 80 |
| | A + AB |
| 66.3E | 70.5 |
| | AB |
| 71.0 | 60 |
| **72.3** | **48.5** |
| | AB + B |
| 69.0E | 39.5 |
| | B |
| 75.0 | 30 |
| 81.5 | 20 |
| 87.9 | 10 |
| 94.5 | 0 |

750. (132)
B = $C_{12}H_{11}N$
Diphenylamine

| | |
|---|---|
| | A |
| 89.4 | 100.0 |
| | A + B |
| 30.0E | 39.0 |
| | B |
| 52.5 | 0.0 |

751. *v.* p. 176
B = $C_{13}H_{10}$
Fluorene

752. (252)
B = $C_{14}H_{10}$
Anthracene

| | |
|---|---|
| | A |
| 89.5 | 100 |
| | A + B |
| 84.0E | 92 |
| | B |
| 127.2 | 80 |
| 148.5 | 70 |
| 164.5 | 60 |
| 176.5 | 50 |
| 186.7 | 40 |
| 195.6 | 30 |
| 202.3 | 20 |

752.—(*Continued*)

| °C | Wt. % A |
|---|---|
| | B |
| 208.0 | 10 |
| 213.0 | 0 |

753. *v.* p. 176
B = $C_{14}H_{10}$
Phenanthrene

754. (243)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| | A |
| 89.0 | 100.0 |
| | A + B |
| 82.0E | 82.0 |
| | B |
| 159.5 | 0.0 |

*v. also* 43, 74, 271, 387, 391, 404, 465, 466, 556, 583, 708

$C_6H_4N_2O_4$
*p*-Dinitrobenzene

755. (228)
B = $C_6H_6$

| °C | Mol % B |
|---|---|
| | B |
| 5.2 | 0.0 |
| | A + B |
| 4.8E | 0.6 |
| | A |
| 28.0 | 1.7 |
| 80.9B.P. | 8.0 |

756. (259)
B = $C_6H_7N$
Aniline

| °C | Mol % A |
|---|---|
| | A |
| 143.5 | 61.0 |
| 131.0 | 51.1 |
| 117.0 | 42.4 |
| 102.0 | 34.4 |
| 72.0 | 22.6 |
| 36.5 | 12.5 |
| 15.0 | 9.0 |

757. (264)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| °C | Wt. % A |
|---|---|
| | A |
| 170.0 | 100.0 |
| | A + B |
| 84.3E | 35.0 |
| | B |
| 100.0 | 0.0 |

758. (264)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| | |
|---|---|
| | A |
| 170.0 | 100.0 |
| | A + B |
| 55.0E | 19.0 |
| | B |
| 62.0 | 0.0 |

759. (264)
B = $C_6H_8N_2$
*p*-Phenylenediamine

| °C | Wt. % A |
|---|---|
| | A |
| 170.0 | 100.0 |
| | A + $AB_2$ |
| 112E | 47.5 |
| | $AB_2$ |
| **114.0***ca.* | **43.7** |
| | $AB_2$ + B |
| 112.0E | 38.5 |
| | B |
| 138.0 | 0.0 |

760. (258)
B = $C_7H_6O_2$
*m*-Hydroxybenzaldehyde

| | |
|---|---|
| | A |
| 171.0 | 100.0 |
| | A + B |
| 91.0E | 20.0 |
| | B |
| 105.0 | 0.0 |

761. (256)
B = $C_7H_9N$
*p*-Toluidine

| | |
|---|---|
| | A |
| 169.5 | 100.0 |
| | A + B |
| 36.5E | 16.0 |
| | B |
| 42.5 | 0.0 |

762. (259)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % A |
|---|---|
| | A |
| 170.5 | 100.0 |
| 161.0 | 86.6 |
| 150.0 | 70.7 |
| 130.0 | 52.7 |
| | A + AB |
| 117.5U | 54.9 |
| | AB |
| 116.5 | 40.0 |
| 109.5 | 26.5 |
| 98.8 | 18.7 |
| | AB + B |
| 76.5E | 7.0 |
| | B |
| 79.0 | 2.7 |
| 80.0 | 0.0 |

763. (237)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Wt. % A |
|---|---|
| | A |
| 169.5 | 100 |
| 160.5 | 90 |
| 151.0 | 80 |
| 141.0 | 70 |
| 129.0 | 60 |
| 114.5 | 50 |

763.—(*Continued*)

| °C | Wt. % A |
|---|---|
| | A + AB |
| 81.8U | 39 |
| | AB |
| 76.5 | 30 |
| 58.5 | 20 |
| | AB + B |
| 40.0E | 13 |
| | B |
| 41.9 | 10 |
| 48.0 | 0 |

764. (237)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| | A |
| 169.5 | 100 |
| 161.2 | 90 |
| 152.5 | 80 |
| 143.0 | 70 |
| 131.3 | 60 |
| 117.0 | 50 |
| | A + AB |
| 91.0U | 40.5 |
| | AB + B |
| 87.8E | 32.5 |
| | B |
| 97.0 | 20 |
| 103.3 | 10 |
| 109.0 | 0 |

765. (265)
B = $C_{12}H_9N$
Carbazole

| | |
|---|---|
| | A |
| 171.5 | 100 |
| 165.5 | 90 |
| 158.3 | 80 |
| | A + B |
| 143.0E | 66.5 |
| | B |
| 159.0 | 60 |
| 182.5 | 50 |
| 202.5 | 40 |
| 217.5 | 30 |
| 227.0 | 20 |
| 232.2 | 10 |
| 236.0 | 0 |

766. *v.* p. 176
B = $C_{12}H_{10}$
Acenaphthene

767. *v.* p. 176
B = $C_{13}H_{10}$
Fluorene

768. *v.* p. 176
B = $C_{14}H_{10}$
Anthracene

769. (228)
B = $C_{14}H_{10}$
Phenanthrene

| °C | Wt. % A |
|---|---|
| | A |
| 172.0 | 100 |
| | A + $AB_3$ |
| 79.0E | 28 |

**$C_6H_4N_2O_4$.—(*Continued*)**

769.—(*Continued*)

| °C | Wt. % A |
|---|---|
| AB$_3$ | |
| **81.0** | **24** |
| AB$_3$ + B | |
| 80.0E | 23 |
| B | |
| 103.0 | 0 |

770. (243)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| °C | Mol % A |
|---|---|
| A | |
| 171.0 | 100.0 |
| A + B | |
| 132.0E | 36.0 |
| B | |
| 159.5 | 0.0 |

*v. also* 75

**$C_6H_4N_2O_5$**
2, 3-Dinitrophenol
771. (423)
B = $C_6H_6$

| | |
|---|---|
| 145.1 | 100 |
| 138.2 | 90 |
| 125.1 | 80 |
| 118.9 | 70 |
| 113.5 | 60 |
| 108.5 | 50 |
| 103.2 | 40 |
| 97.2 | 30 |
| 88.6 | 20 |
| 74.3 | 10 |

**$C_6H_4N_2O_5$**
2, 4-Dinitrophenol
772. *v.* p. 176
B = $C_6H_5NO_3$
*o*-Nitrophenol

773. (423)
B = $C_6H_6$

| | |
|---|---|
| 112.9 | 100 |
| 102.3 | 90 |
| 94.5 | 80 |
| 87.7 | 70 |
| 82.0 | 60 |
| 75.8 | 50 |
| 69.0 | 40 |
| 61.2 | 30 |
| 49.0 | 20 |

774. (224)
B = $C_6H_7N$
Aniline

| °C | Mol % A |
|---|---|
| A | |
| 110.5 | 100 |
| 106.0 | 90 |
| 100.0 | 80 |
| 92.5 | 70 |
| 84.0 | 60 |
| 79.7 | 55 |

774.—(*Continued*)

| °C | Mol % A |
|---|---|
| A + AB | |
| 74.0U | 50 |
| AB | |
| 73.8 | 45 |
| 73.4 | 40 |
| 70.7 | 30 |
| 62.5 | 20 |
| 45.5 | 10 |
| +24.0 | 5 |
| AB + B | |
| − 7.0E | 1.5 |
| B | |
| − 6.3 | 0.0 |

775. (272)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| °C | Wt. % A |
|---|---|
| A | |
| 110.0 | 100.0 |
| A + AB | |
| 83.5E | 74.0 |
| AB | |
| **85.0** | **63** |
| AB + B | |
| 72.0E | 43.0 |
| B | |
| 100.2 | 0.0 |

776. (272)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| | |
|---|---|
| A | |
| 111.0 | 100.0 |
| A + AB | |
| 91.5E | 75.0 |
| AB | |
| **100.0** | **63** |
| AB + B | |
| 53.0E | 19.0 |
| B | |
| 62.0 | 0.0 |

777. (272)
B = $C_6H_8N_2$
*p*-Phenylenediamine

| | |
|---|---|
| A | |
| 110.0 | 100.0 |
| A + A$_2$B | |
| 107.0E | 97.0 |
| A$_2$B | |
| **118.0** | **83.6** |
| A$_2$B + A$_2$B | |
| 109.0U | 74.0 |
| A$_2$B + B | |
| 88.5E | 37.5 |
| B | |
| 138.5 | 0.0 |

778. (258)
B = $C_7H_6O_2$
*m*-Hydroxybenzaldehyde

| | |
|---|---|
| A | |
| 112.0 | 100.0 |
| A + AB | |
| 78.0 | 63.0 |

778.—(*Continued*)

| °C | Wt. % A |
|---|---|
| AB | |
| **78.5** | **60.0** |
| AB + B | |
| 78.0E | 43.0 |
| B | |
| 105.0 | 0.0 |

779. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| °C | Mol % A |
|---|---|
| A | |
| 114.0 | 100 |
| 111.7 | 95 |
| 108.6 | 90 |
| 104.8 | 85 |
| 100.3 | 80 |
| 95.1 | 75 |
| 89.1 | 70 |
| 80.3 | 65 |
| A + AB | |
| 73.0E | 61.5 |
| AB | |
| 77.4 | 55 |
| **78.4** | **50** |
| AB + B | |
| 77.3E | 44 |
| B | |
| 87.3 | 40 |
| 97.2 | 35 |
| 105.8 | 30 |
| 112.5 | 25 |
| 117.9 | 20 |
| 122.7 | 15 |
| 126.6 | 10 |
| 132.1 | 0 |

780. (249)
B = $C_8H_8O$
Acetophenone

| °C | Wt. % A |
|---|---|
| A | |
| 110.0 | 100.0 |
| A + B | |
| 12.0E | 21.0 |
| B | |
| 20.5 | 0.0 |

781. *v.* p. 176
B = $C_8H_9NO$
Acetanilide

781.1. (274.1)
B = $C_9H_8O_2$
Cinnamic acid

| °C | Wt. % A |
|---|---|
| A | |
| 112.0 | 100 |
| A + AB? | |
| 91.0E | 70.0 |
| AB? | |
| **91.0** | |
| AB? + B | |
| 91.0U | 59.0 |
| B | |
| 133.0 | 0 |

782. (222, 410)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % A |
|---|---|
| A | |
| 111.4 | 100 |
| 105.8 | 90 |
| 99.8 | 80 |
| 93.3 | 70 |
| A + AB | |
| 88.5E | 63.5 |
| AB | |
| 90.1 | 60 |
| **92.0** | **50** |
| 91.3 | 40 |
| 87.4 | 30 |
| 78.2 | 20 |
| AB + B | |
| 71.5E | 14.8 |
| B | |
| 74.6 | 10 |
| 80.1 | 0 |

783. (237)
B = $C_{10}H_9N$
*α*-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 109.0 | 100 |
| 104.8 | 90 |
| 96.5 | 80 |
| A + AB | |
| 90.0E | 74 |
| AB | |
| 97.2 | 70 |
| **104.5** | **56.3** |
| 103.8 | 50 |
| 98.7 | 40 |
| 88.8 | 30 |
| 74.0 | 20 |
| 51.2 | 10 |
| AB + B | |
| 42.0E | 7 |
| B | |
| 48.0 | 0 |

784. (237)
B = $C_{10}H_9N$
*β*-Naphthylamine

| | |
|---|---|
| A | |
| 109.0 | 100 |
| 103.5 | 90 |
| 95.2 | 80 |
| 84.6 | 70 |
| A + AB | |
| 72.0E | 60.5 |
| AB | |
| **72.3** | **56.3** |
| AB + B | |
| 72.0E | 49.5 |
| B | |
| 81.7 | 40 |
| 90.5 | 30 |
| 97.8 | 20 |
| 103.8 | 10 |
| 109.0 | 0 |

785. (108, 253)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 111.4 | 100.0 |
| A + B | |
| 69.3E | 30.7 |
| B | |
| 178.0 | 0.0 |

786. (234)
B = $C_{10}H_{16}O$
Fenchone

| °C | Wt. % A |
|---|---|
| A | |
| 111.0 | 100.0 |
| A + B | |
| 2.0E | 6.0 |
| B | |
| 5.3 | 0.0 |

787. (238)
B = $C_{11}H_{12}N_2O$
Antipyrine

| | |
|---|---|
| A | |
| 110.5 | 100.0 |
| Vis. | |
| | 62.2 to |
| 60 to 58 | 38.9 |
| B | |
| 109.8 | 0.0 |

788. (263)
B = $C_{12}H_9N$
Carbazole

| | |
|---|---|
| A | |
| 110.0 | 100 |
| 103.5 | 90 |
| A + B | |
| 98.6E | 83 |
| B | |
| 141.5 | 70 |
| 165.0 | 60 |
| 184.0 | 50 |
| 199.2 | 40 |
| 211.0 | 30 |
| 220.8 | 20 |
| 229.0 | 10 |
| 236.5 | 0 |

789. (239)
B = $C_{12}H_{10}$
Acenaphthene

| | |
|---|---|
| A | |
| 110.0 | 100.0 |
| A + AB | |
| 83.0E | 68.0 |
| AB | |
| **86.0** | **54.4** |
| AB + B | |
| 74.0E | 29.0 |
| B | |
| 90.5 | 0.0 |

789.1. (274.2)
B = $C_{12}H_{10}N_2$
Azobenzene

789.1.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 112.0 | 100 |
| A + B | |
| 54.0E | 28.0 |
| B | |
| 67 | 0 |

790. (261)
B = $C_{12}H_{11}N$
Diphenylamine

| | |
|---|---|
| A | |
| 108.0 | 100.0 |
| A + B | |
| 41.6E | 28.0 |
| B | |
| 52.0 | 0.0 |

791. *v.* p. 176
B = $C_{13}H_{10}$
Fluorene

792. (249)
B = $C_{13}H_{10}O$
Benzophenone

| °C | Wt. % A |
|---|---|
| A | |
| 110.0 | 100.0 |
| A + B | |
| 35.0E | 20.0 |
| B | |
| 47.0 | 0.0 |

792.1. (234.1)
B = $C_{13}H_{12}O$
Benzhydrol

| | |
|---|---|
| A | |
| 112.5 | 100 |
| A + B | |
| 51.0E | 19.0 |
| B | |
| 64.5 | 0 |

793. *v.* p. 176
B = $C_{14}H_{10}$
Anthracene

794. (241)
B = $C_{14}H_{10}$
Phenanthrene

| °C | Wt. % B |
|---|---|
| B | |
| 103 | 100.0 |
| 96 | 89.4 |
| 90 | 83.3 |
| 83 | 75.9 |
| 68 | 61.6 |
| A + B | |
| 61.5E | 56.5 |
| A | |
| 67 | 51.7 |
| 82 | 39.7 |
| 96 | 23.9 |
| 101 | 15.1 |
| 107 | 7.0 |
| 111 | 0.0 |

*v. also* 440, 458.2, 459.1, 476, 584

**$C_6H_4N_2O_5$**
2, 5-Dinitrophenol
795. (423)
B = $C_6H_6$

| °C | Wt. % A |
|---|---|
| 105.6 | 100 |
| 95.4 | 90 |
| 87.0 | 80 |
| 80.3 | 70 |
| 74.5 | 60 |
| 68.6 | 50 |
| 61.7 | 40 |
| 58.7 | 30 |
| 49.0 | 20 |
| 20.0 | 10 |

**$C_6H_4N_2O_5$**
2, 6-Dinitrophenol
796. (423)
B = $C_6H_6$

| | |
|---|---|
| 62.2 | 100 |
| 52.4 | 90 |
| 45.3 | 80 |
| 39.2 | 70 |
| 33.8 | 60 |
| 28.9 | 50 |
| 23.7 | 40 |

**$C_6H_4N_2O_5$**
3, 4-Dinitrophenol
797. (423)
B = $C_6H_6$

| | |
|---|---|
| 134.7 | 100 |
| 125.2 | 90 |
| 118.8 | 80 |
| 115.2 | 70 |
| 112.7 | 60 |
| 110.5 | 50 |
| 108.9 | 40 |
| 107.2 | 30 |
| 102.8 | 20 |
| 93.5 | 10 |

*v. also* 1860

**$C_6H_4N_2O_6$**
2, 4-Dinitro-resorcinol
798. (108)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 142.7 | 100.0 |
| A + B | |
| 47.2E | 29.0 |
| B | |
| 178.0 | 0.0 |

**$C_6H_4N_4O_6$**
Picramide
799. (107)
B = $C_{10}H_8$
Naphthalene

| °C | Wt. % A |
|---|---|
| A | |
| 185.2 | 100.0 |

799.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A + AB | |
| 157.6E | 84.6 |
| AB | |
| **168.8** | **64** |
| AB + B | |
| 75.8E | 10.5 |
| B | |
| 80.0 | 0.0 |

800. (107)
B = $C_{12}H_{10}$
Acenaphthene

| | |
|---|---|
| A | |
| 185.2 | 100.0 |
| A + AB | |
| 178.1E | 93.2 |
| AB | |
| **195.4** | **59.6** |
| AB + B | |
| 93.6E | 4.4 |
| B | |
| 96.2 | 0.0 |

801. (107)
B = $C_{13}H_{10}$
Fluorene

| | |
|---|---|
| A | |
| 185.2 | 100.0 |
| A + AB | |
| 127.5U | 53.0 |
| AB + B | |
| 96.3E | 19.8 |
| B | |
| 112.3 | 0.0 |

802. (107)
B = $C_{14}H_{10}$
Anthracene

| | |
|---|---|
| A | |
| 185.2 | 100.0 |
| A + AB | |
| 149.6E | 74.5 |
| AB | |
| **158.8** | **56.1** |
| AB + B | |
| 152.3E | 50.3 |
| B | |
| 213.0 | 0.0 |

803. (107)
B = $C_{14}H_{10}$
Phenanthrene

| | |
|---|---|
| A | |
| 185.2 | 100.0 |
| A + AB | |
| 147.1E | 70.4 |
| AB | |
| **160.2** | **56.1** |
| AB + B | |
| 93.4E | 15.7 |
| B | |
| 99.2 | 0.0 |

804. (107)
B = $C_{18}H_{18}$
Retene

| | |
|---|---|
| A | |
| 185.2 | 100.0 |

804.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A + AB | |
| 124.3 | 52.0 |
| AB | |
| **125.1** | **49.3** |
| AB + B | |
| 76.7E | 12.3 |
| B | |
| 95.2 | 0.0 |

*v. also* 585

**$C_6H_4O_2$**
*p*-Quinone
805. (266)
B = $C_6H_5NO_2$
Nitrobenzene

| | |
|---|---|
| 100 | 75.6 |
| 80 | 48.8 |
| 60 | 34.2 |
| 40 | 23.5 |

*v. also* 1860

806. (266)
B = $C_6H_6O_2$
Hydroquinol

| | |
|---|---|
| A | |
| 114.5 | 100 |
| A + AB | |
| 107.0E | 97 |
| AB | |
| 140.0 | 90 |
| 153.0 | 80 |
| 161.0 | 70 |
| 166.7 | 60 |
| **169.0** | **50** |
| 165.5 | 40 |
| 158.0 | 30 |
| AB + B | |
| 150.0E | 22 |
| B | |
| 161.0 | 10 |
| 165.0 | 5 |
| 169.0 | 0 |
| (A metastable) | |
| A | |
| 114.5 | 100 |
| 107.0m | 90 |
| 97.5m | 80 |
| 86.5m | 70 |
| A + AB | |
| 75mE | 62 |
| AB | |
| 105.0m | 59 |
| 135.0m | 55 |
| 168m *ca.* | *ca.* 45 |
| 165.5m | 40 |
| 158.0m | 30 |
| AB + B | |
| 150.0E | 22 |
| B | |
| 161.0 | 10 |
| 165.0 | 5 |
| 169.0 | 0 |

*v. also* 1860

807. (266)
B = $C_{10}H_8$
Naphthalene

| °C | Wt. % A |
|---|---|
| A | |
| 115.0 | 100 |
| A + B | |
| 58.0E | 34 |
| B | |
| 80.0 | 0 |

808. (266)
B = $C_{10}H_8O$
*β*–Naphthol

| | |
|---|---|
| A | |
| 116.0 | 100 |
| 113.5 | 95 |
| 110.0 | 90 |
| 102 | 80 |
| 93.0 | 70 |
| A + AB | |
| 81.0E | 58 |
| AB | |
| 84.5 | 50 |
| **85.3** | **42.8** |
| AB + B | |
| 79.0E | 29 |
| B | |
| 95.0 | 20 |
| 111.0 | 10 |
| 117.0 | 5 |
| 122.0 | 0 |

*v. also* 1860

809. (266)
B = $C_{10}H_9N$
*α*-Naphthylamine

| | |
|---|---|
| A | |
| 116.0 | 100 |
| 113.0 | 95 |
| 109.5 | 90 |
| 100.5 | 80 |
| 91.0 | 70 |
| 80.5 | 60 |
| 74.5 | 55 |
| 67.8 | 50 |
| A + AB | |
| 59.0E | 44 |
| AB | |
| **59.0** | **43** |
| 59.0 | 40 |
| 49.0 | 30 |
| 38.0 | 20 |
| AB + B | |
| 27.0E | 17 |
| B | |
| 37.0 | 10 |
| 43.5 | 5 |
| 49.0 | 0 |

*v. also* 1860

810. (266)
B = $C_{12}H_{10}$
Acenaphthene

| | |
|---|---|
| A | |
| 115.0 | 100 |
| A + B | |
| 67.0E | 37 |

810.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 93.0 | 0 |

811. (266)
B = $C_{12}H_{11}N$
Diphenylamine

| | |
|---|---|
| A | |
| 115.0 | 100 |
| A + B | |
| 32.0E | 24 |
| B | |
| 54.0 | 0 |

812. (266)
B = $C_{13}H_{10}$
Fluorene

| | |
|---|---|
| A | |
| 115.0 | 100 |
| A + B | |
| 72.0E | 41 |
| B | |
| 111.0 | 0 |

813. (266)
B = $C_{14}H_{10}$
Anthracene

| | |
|---|---|
| A | |
| 115.0 | 100 |
| A + AB | |
| 102.5E | 86 |
| AB | |
| **196.0** | **37.7** |
| AB + B | |
| 189.0E | 25 |
| B | |
| 213.0 | 0 |

*v. also* 1860

814. (266)
B = $C_{14}H_{10}$
Phenanthrene

| | |
|---|---|
| A | |
| 115.0 | 100 |
| A + B | |
| 61.0E | 30 |
| B | |
| 98.0 | 0 |

815. (266)
B = $C_{19}H_{16}$
Triphenylmethane

| | |
|---|---|
| A | |
| 115.0 | 100 |
| A + B | |
| 69.0E | 22 |
| B | |
| 90.0 | 0 |

816. (266)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| A | |
| 116.0 | 100 |
| A + B | |
| 93.0E | 39 |
| B | |
| 161.0 | 0 |

*v. also* 123, 1860

**$C_6H_5Br$**
Bromobenzene
817. (364)
B = $C_6H_5Cl$
Chlorobenzene

| °C | | Wt. % A |
|---|---|---|
| Mix | | |
| $t_L$ | $t_S$ | |
| −28.1 | −28.1 | 100 |
| −30.5 | −31.1 | 90 |
| −33.1 | −33.9 | 80 |
| −35.0 | −36.3 | 70 |
| −36.8 | −38.3 | 60 |
| −38.7 | −39.8 | 50 |
| −40.1 | −41.4 | 40 |
| −41.2 | −42.4 | 30 |
| −42.3 | −43.2 | 20 |
| −43.3 | −43.9 | 10 |
| −44.0 | −44.0 | 0 |

818. (364)
B = $C_6H_5F$
Fluorobenzene

| Mixed crystals | | |
|---|---|---|
| −28.1 | −28.1 | 100 |
| −35.3 | −38.0 | 90 |
| −42.5 | −48.5 | 80 |
| −49.7 | −58.5 | 70 |
| −57.0 | −62.5 | 60 |
| −62.5E | −62.5E | 52.5 |
| −57.2 | −62.5 | 40 |
| −53.1 | −62.5 | 30 |
| −48.9 | −62.5 | 20 |
| −44.7 | −50.5 | 10 |
| −40.5 | −40.5 | 0 |

819. (364)
B = $C_6H_5I$
Iodobenzene

| Mix. | | |
|---|---|---|
| −28.1 | −28.1 | 100 |
| −29.6 | −32.0 | 90 |
| −32.1 | −35.0 | 80 |
| −35.5 | −36.3 | 70 |
| −36.5† | −36.5† | 65 |
| −35.5 | −36.2 | 60 |
| −32.9 | −35.5 | 50 |
| −31.7 | −34.5 | 40 |
| −31.0 | −33.3 | 30 |
| −30.4 | −32.2 | 20 |
| −29.7 | −30.8 | 10 |
| −29.0 | −29.0 | 0 |

820. (428)
B = $C_6H_5NO_3$
*o*-Nitrophenol

| °C | Wt. % A |
|---|---|
| 44.9 | 0 |
| 42.5 | 5 |
| 40.1 | 10 |
| 35.6 | 20 |
| 31.3 | 30 |
| 26.2 | 40 |
| 20.6 | 50 |

821. (428)
B = $C_6H_5NO_3$
*p*-Nitrophenol

| | |
|---|---|
| 114.0 | 0 |
| 109.0 | 5 |
| 105.3 | 10 |
| 99.5 | 20 |
| 94.5 | 30 |
| 90.0 | 40 |
| 87.2 | 50 |

### $C_6H_5Br$.—(*Continued*)

821.—(*Continued*)

| °C | Wt. % A |
|---|---|
| 83.7 | 60 |
| 78.0 | 70 |

*v. also* 677, 728

### $C_6H_5BrO$

*o*-Bromophenol

822. *v.* p. 176

B = $C_6H_5BrO$

*p*-Bromophenol

### $C_6H_5Cl$

Chlorobenzene

823. (364)

B = $C_6H_5F$

Fluorobenzene

Mixed crystals

| $t_L$ | $t_S$ | Wt. % A |
|---|---|---|
| −44.0 | −44.0 | 100 |
| −48.2 | −52.0 | 90 |
| −52.8 | −60.8 | 80 |
| −58.2 | −71.0 | 70 |
| −64.6 | −71.0 | 60 |
| −71.0E | −71.0E | 52 |
| −62.6 | −71.0 | 40 |
| −56.0 | −71.0 | 30 |
| −50.2 | −64.5 | 20 |
| −45.1 | −50.5 | 10 |
| −40.5 | −40.5 | 0 |

824. (364)

B = $C_6H_5I$

Iodobenzene

Mix.

| | | |
|---|---|---|
| −44.0 | −44.0 | 100 |
| −45.7 | −47.9 | 90 |
| −48.2 | −49.7 | 80 |
| −50.1 | −50.7 | 70 |
| −51.5† | −51.5† | 57 |
| −51.1 | −51.2 | 50 |
| −48.9 | −49.6 | 40 |
| −45.7 | −47.4 | 30 |
| −41.6 | −44.5 | 20 |
| −35.8 | −39.9 | 10 |
| −29.0 | −29.0 | 0 |

825. *v.* p. 176

B = $C_7H_5ClO$

Benzoyl chloride

826. (364)

B = $C_7H_5N$

Cyanobenzene

Mixed crystals

| | | |
|---|---|---|
| −44.0 | −44.0 | 100 |
| −48.4 | −51.6 | 90 |
| −54.4 | −63.0 | 80 |
| −63.7E | −63.7E | 66.5 |
| −56.1 | −63.7 | 60 |
| −45.5 | −63.7 | 50 |
| −36.5 | −55.0 | 40 |
| −28.9 | −40.5 | 30 |
| −22.4 | −29.0 | 20 |
| −16.9 | −20.0 | 10 |
| −12.1 | −12.1 | 0 |

827. *v.* p. 176

B = $C_{10}H_8$

Naphthalene

827.1. (475)

B = $C_{10}H_9N$

α-Naphthylamine

| °C | Mol % A |
|---|---|
| −4.0 | 80 |
| +7.5 | 70 |
| 14.5 | 60 |
| 20.0? | 50 |
| 24.0? | 40 |
| 29.0? | 30 |
| 37.4 | 20 |
| 43.2 | 10 |
| 46.3 | 5 |
| 49.4 | 0 |

827.2. (475)

B = $C_{10}H_9N$

β-Naphthylamine

| | |
|---|---|
| 4.5 | 97.5 |
| 27.0 | 95 |
| 43.5 | 90 |
| 61.0 | 80 |
| 71.0 | 70 |
| 79.0 | 60 |
| 85.5 | 50 |
| 91.0 | 40 |
| 96.0 | 30 |
| 100.5 | 20 |
| 105.0 | 10 |
| 108.0 | 5 |
| 110.6 | 0 |

828. (475)

B = $C_{12}H_9N$

Carbazole

| °C | g B per 100 g A |
|---|---|
| 20.0 | 0.55 |
| 30.0 | 0.76 |
| 40.0 | 1.07 |
| 50.0 | 1.45 |
| 60.0 | 2.0 |
| 70.0 | 2.75 |
| 80.0 | 3.7 |
| 100.0 | 7.0 |

829. *v.* p. 176

B = $C_{12}H_{10}$

Acenaphthene

830. *v.* p. 176

B = $C_{13}H_{10}$

Fluorene

831. *v.* p. 176

B = $C_{14}H_{10}$

Anthracene

832. *v.* p. 176

B = $C_{14}H_{10}$

Phenanthrene

*v. also* 290.1, 817

### $C_6H_5ClN_2O_2$

1-Amino-2-nitro-4-chloroaniline

833. (62)

B = $C_6H_5ClN_2O_2$

1-Amino-3-nitro-4-chloroaniline

833.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 115.7 | 100 |
| A + B | |
| 73.6E | 45 |
| B | |
| 102.7 | 0 |

### $C_6H_5ClO$

*o*-Chlorophenol

834. *v.* p. 176

B = $C_6H_5ClO$

*p*-Chlorophenol

835. (429)

B = $C_6H_6$

| °C | Wt. % A |
|---|---|
| A | |
| + 7.0 | 100 |
| − 0.2 | 90 |
| − 7.0 | 80 |
| −13.3 | 70 |
| A + B | |
| −19.5E | 61.5 |
| B | |
| −13.6 | 50 |
| − 9.3 | 40 |
| − 5.3 | 30 |
| − 1.4 | 20 |
| + 2.2 | 10 |
| 5.4 | 0 |

836. (53)

B = $C_6H_7N$

Aniline

| °C | Mol % A |
|---|---|
| A | |
| + 8.0 | 100.0 |
| A + AB | |
| − 1.75E | 83.8 |
| AB | |
| **+29.4** | **50.0** |
| AB + B | |
| −12.0E | 9.7 |
| B | |
| − 6.5 | 0.0 |

837. (53)

B = $C_8H_{11}N$

Dimethylaniline

| | |
|---|---|
| A | |
| + 8.0 | 100.0 |
| A + AB | |
| − 2.8E | 84.0 |
| AB | |
| **+16.7** | **50.0** |
| AB + B | |
| − 4.5E | 12.5 |
| B | |
| + 1.0 | 0.0 |

838. (53)

B = $C_9H_7N$

Quinoline

| | |
|---|---|
| A | |
| + 8.0 | 100.0 |
| A + AB | |
| −10.9E | 79.1 |

838.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB | |
| **+47.4** | **50.0** |
| AB + B | |
| −27.6E | 9.6 |
| B | |
| −19.5 | 0.0 |

839. (53)

B = $C_{13}H_{13}N$

Diphenylmethylamine

| | |
|---|---|
| A | |
| + 8.0 | 100 |
| A + B | |
| −29.1E | 43.6 |
| B | |
| − 9.6 | 0.0 |

*v. also* 370, 508

### $C_6H_5ClO$

*m*-Chlorophenol

840. (429)

B = $C_6H_6$

| °C | Wt. % A |
|---|---|
| A | |
| 32.5 | 100 |
| 24.8 | 90 |
| 17.4 | 80 |
| 10.6 | 70 |
| +5.0 | 60 |
| −0.3 | 50 |
| A + B | |
| −7.0E | 39.7 |
| B | |
| −4.0 | 30 |
| −1.0 | 20 |
| +2.3 | 10 |
| 5.4 | 0 |

### $C_6H_5ClO$

*p*-Chlorophenol

841. (429)

B = $C_6H_6$

| | |
|---|---|
| A | |
| 41.0 | 100 |
| 33.0 | 90 |
| 25.5 | 80 |
| 18.9 | 70 |
| 12.6 | 60 |
| +5.7 | 50 |
| A + B | |
| −5.5E | 37.5 |
| B | |
| −3.3 | 30 |
| −0.4 | 20 |
| +2.5 | 10 |
| 5.4 | 0 |

*v. also* 834

### $C_6H_5Cl_2N$

2, 4-Dichloroaniline

842. (138)

B = $C_{12}H_{11}N$

Diphenylamine

842.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 59.5 | 100 |
| A + B | |
| 30E *ca.* | 44 |
| B | |
| 52.9 | 0 |

### $C_6H_5F$

Fluorobenzene

843. (364)

B = $C_6H_5I$

Iodobenzene

Mixed crystals

| $t_L$ | $t_S$ | °C | Wt. % A |
|---|---|---|---|
| −40.5 | −40.5 | 100 | |
| −42 6 | −47.0 | 90 | |
| −45.3 | −53.5 | 80 | |
| −48.4 | −60.0 | 70 | |
| −51.7 | −60.5 | 60 | |
| −55.0 | −60.5 | 50 | |
| −58.1 | −60.5 | 40 | |
| −60.5E | −60.5E | 32.5 | |
| −48.4 | −53.0 | 20 | |
| −38.7 | −41.0 | 10 | |
| −29.0 | −29.0 | 0 | |

*v. also* 818, 823

### $C_6H_5I$

Iodobenzene

*v.* 819, 824, 843

### $C_6H_5IO$

*o*-Iodophenol

844. *v.* p. 176

B = $C_6H_5IO$

*p*-Iodophenol

### $C_6H_5NO$

Nitrosobenzene

845. (201)

B = $C_6H_5NO_2$

Nitrobenzene

| °C | Wt. % A |
|---|---|
| A | |
| 68.0 | 100 |
| 61.5 | 90 |
| 54.5 | 80 |
| 47.5 | 70 |
| 40.0 | 60 |
| 32.5 | 50 |
| 24.5 | 40 |
| 16.5 | 30 |
| 8.0 | 20 |
| A + B | |
| 0.0 | 10 |
| B | |
| 5.0 | 0 |

846. (220)

B = $C_6H_7N$

Aniline

| °C | Mol % A |
|---|---|
| A | |
| 63.5 | 100 |
| 59.0 | 90 |
| 53.9 | 80 |

846.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 48.2 | 70 |
| 41.7 | 60 |
| 33.5 | 50 |
| 22.7 | 40 |
| + 7.8 | 30 |
| A + B | |
| −13.0E | 19 |
| B | |
| − 9.5 | 10 |
| − 6.0 | 0 |

### $C_6H_5NO_2$

Nitrobenzene

848. *v.* p. 176

B = $C_6H_6$

850. *v.* p. 176

B = $C_6H_6N_2O_2$

*o*-Nitroaniline

851. *v.* p. 176

B = $C_6H_6N_2O_2$

*m*-Nitroaniline

852. *v.* p. 176

B = $C_6H_6N_2O_2$

*p*-Nitroaniline

853. *v.* p. 176

B = $C_6H_6O$

Phenol

854. (344)

B = $C_6H_6O_2$

Resorcinol

| °C | Mol % A |
|---|---|
| 110.4 | 0 |
| 104.5 | 10 |
| 98.0 | 20 |
| 90.8 | 30 |
| 83.4 | 40 |
| 75.6 | 50 |
| 67.2 | 60 |
| 57.7 | 70 |
| 46.0 | 80 |
| 29.0 | 90 |

855. (222)

B = $C_6H_7N$

Aniline

| | |
|---|---|
| A | |
| + 2.8 | 100.0 |
| − 6.1 | 86.3 |
| −14.7 | 69.5 |
| −20.4 | 57.0 |
| −24.1 | 50.6 |
| A + B | |
| −29.8E | 41.0 |
| B | |
| −22.3 | 28.9 |
| −15.6 | 16.0 |
| − 6.1 | 0.0 |

857. *v.* p. 176

B = $C_7H_5ClO$

Benzoyl chloride

858. *v.* p. 176

B = $C_7H_6O_2$

Benzoic acid

859. (430)
B = $C_7H_7NO_2$
*o*-Nitrotoluene

| °C | Wt. % A |
|---|---|
| 5.22 | 100 |
| 4.25 | 98 |
| 3.18 | 96 |
| 2.07 | 94 |
| 1.04 | 92 |
| 0.0 | 90 |

860. (430)
B = $C_7H_7NO_2$
*p*-Nitrotoluene

| | |
|---|---|
| 5.22 | 100 |
| 4.14 | 98 |
| 3.06 | 96 |
| 2.00 | 94 |
| +0.95 | 92 |
| −0.22 | 90 |

861. *v.* p. 176
B = $C_{10}H_8$
Naphthalene

862. (86, 413)
B = $C_{10}H_{20}O$
Menthol

| °C | Mol % A |
|---|---|
| A | |
| 5.7 | 100.0 |
| 2.9 | 93.7 |
| A + B | |
| 2.6E | 91.2 |
| B | |
| 10.2 | 88 |
| 16.2 | 81.7 |
| 22.0 | 70.1 |
| 23.8 | 61.2 |
| 25.7 | 51.7 |
| 27.4 | 41.6 |
| 29.5 | 31.2 |
| 31.9 | 21.1 |
| 35.2 | 11.2 |
| 40.3 | 3.6 |
| 42.0 | 0.0 |

863. *v.* p. 177
B = $C_{12}H_9N$
Carbazole

864. *v.* p. 177
B = $C_{12}H_{10}$
Acenaphthene

865. (413)
B = $C_{12}H_{18}O_8$
Diethyl diacetyltartrate

| | |
|---|---|
| A | |
| 5.7 | 100.0 |
| 0.0 | 90.02 |
| A + B | |
| − 1.65E | 86.68 |
| B | |
| +13.4 | 77.22 |
| 24.4 | 67.72 |
| 34.55 | 55.86 |
| 43.0 | 41.99 |
| 50.0 | 29.55 |

865.—(*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| 56.0 | 18.21 |
| 60.9 | 9.57 |
| 67.0 | 0.0 |

866. *v.* p. 177
B = $C_{13}H_{10}$
Fluorene

867. *v.* p. 177
B = $C_{14}H_8O_2$
Anthraquinone

868. *v.* p. 177
B = $C_{14}H_{10}$
Anthracene

868.1. *v.* p. 177
B = $C_{14}H_{10}$
Phenanthrene

868.2. (48)
B = $C_{14}H_{14}N_2O_2$
*p*-Azoxyanisole

| | |
|---|---|
| A | |
| 5.4 | 100 |
| A + B | |
| 3.2E | 96.9 |
| B | |
| 17.0 | 95 |
| 39.5 | 90 |
| 60.5 | 80 |
| 73.5 | 70 |
| 83.0 | 60 |
| 91.0 | 50 |
| 98.0 | 40 |
| 103.5 | 30 |
| 109.0 | 20 |
| 113.5 | 10 |
| 118.0 | 0 |

*v. also* 23, 242, 273, 290.2, 678, 729, 805, 820, 845, 1860

$C_6H_5NO_3$
*o*-Nitrophenol
869. *v.* p. 177
B = $C_6H_5NO_3$
*m*-Nitrophenol
*v. also* 1861

870. *v.* p. 177
B = $C_6H_5NO_3$
*p*-Nitrophenol
*v. also* 1861

871. (48, 71)
B = $C_6H_6$

| °C | Wt. % A |
|---|---|
| A | |
| 44.0 | 100 |
| 40.3 | 95 |
| 37.0 | 90 |
| 30.5 | 80 |
| 24.1 | 70 |
| 18.5 | 60 |
| 12.5 | 50 |
| +5.6 | 40 |
| −1.5 | 30 |

871.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| −2.5 | 20 |
| +1.6 | 10 |
| 3.5 | 5 |
| 5.5 | 0 |

872. (259)
B = $C_6H_7N$
Aniline

| °C | Mol % A |
|---|---|
| A | |
| 46.0 | 100.0 |
| 38.0 | 83.3 |
| 27.0 | 63.2 |
| 17.5 | 50.0 |
| +10.0 | 39.4 |
| − 2.5 | 26.1 |
| A + B | |
| −13.5E | 14.2 |
| B | |
| −10.5 | 8.4 |
| − 6.3 | 0.0 |

873. (247)
B = $C_6H_7NO$
*m*-Aminophenol

| °C | Wt. % A |
|---|---|
| A | |
| 44.5 | 100 |
| A + B | |
| 43.5E | 98 |
| B | |
| 118.0 | 0 |

874. (257)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| | |
|---|---|
| A | |
| 45.2 | 100 |
| A + B | |
| 38.8E | 91 |
| B | |
| 53.5 | 80 |
| 64.0 | 70 |
| 72.0 | 60 |
| 78.3 | 50 |
| 83.5 | 40 |
| 88.2 | 30 |
| 92.5 | 20 |
| 96.7 | 10 |
| 101.0 | 0 |

875. (257)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| | |
|---|---|
| A | |
| 45.0 | 100 |
| 39.0 | 90 |
| 35.7 | 80 |
| A + B | |
| 33.5E | 67 |
| B | |
| 37.2 | 60 |
| 41.8 | 50 |
| 45.8 | 40 |
| 49.5 | 30 |
| 53.1 | 20 |

875.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 57.2 | 10 |
| 62.0 | 0 |

876. (257)
B = $C_6H_8N_2$
*p*-Phenylenediamine

| | |
|---|---|
| A | |
| 45.0 | 100 |
| A + B | |
| 42.5E | 95.5 |
| B | |
| 61.8 | 90 |
| 85.0 | 80 |
| 98.5 | 70 |
| 107.8 | 60 |
| 114.8 | 50 |
| 120.5 | 40 |
| 125.3 | 30 |
| 130.0 | 20 |
| 134.8 | 10 |
| 140.0 | 0 |

877. (258)
B = $C_7H_6O_2$
*m*-Hydroxybenzaldehyde

| | |
|---|---|
| A | |
| 44.5 | 100 |
| A + B | |
| 41.0E | 91 |
| B | |
| 105.0 | 0 |

878. (231)
B = $C_7H_7NO$
Benzamide

| | |
|---|---|
| A | |
| 44.8 | 100 |
| A + B | |
| 41.8E | 95 |
| B | |
| 124.8 | 0 |

879. (428)
B = $C_7H_8$
Toluene

| | |
|---|---|
| 44.9 | 100 |
| 41.2 | 95 |
| 38.0 | 90 |
| 32.8 | 80 |
| 27.7 | 70 |
| 22.6 | 60 |
| 17.0 | 50 |
| 10.2 | 40 |
| 2.2 | 30 |

880. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| °C | Mol % A |
|---|---|
| A | |
| 44.7 | 100 |
| 42.3 | 95 |
| 39.8 | 90 |
| 37.2 | 85 |
| 34.3 | 80 |

880.—(*Continued*)

| °C | Mol % A |
|---|---|
| A + B | |
| 33.0E | 77.5 |
| B | |
| 39.0 | 75 |
| 51.8 | 70 |
| 63.5 | 65 |
| 73.9 | 60 |
| 83.0 | 55 |
| 90.2 | 50 |
| 97.3 | 45 |
| 103.0 | 40 |
| 108.0 | 35 |
| 112.2 | 30 |
| 116.1 | 25 |
| 119.8 | 20 |
| 123.2 | 15 |
| 126.3 | 10 |
| 132.1 | 0 |

881. *v.* p. 177
B = $C_7H_9N$
*p*-Toluidine

882. (42)
B = $C_8H_7NO_4$
*o*-Nitrophenyl acetate

| °C | Mol % A |
|---|---|
| A | |
| 44.5 | 100 |
| A + B | |
| 14.0E | 35 |
| B | |
| 37.5 | 0 |

883. (249)
B = $C_8H_8O$
Acetophenone

| °C | Wt. % A |
|---|---|
| A | |
| 44.5 | 100 |
| A + B | |
| 2.5E | 47 |
| B | |
| 20.2 | 0 |

883.1. (274.1)
B = $C_9H_8O_2$
Cinnamic acid

| | |
|---|---|
| A | |
| 44.5 | 100 |
| A + B | |
| 42.0E | 89.0 |
| B | |
| 133.0 | 0 |

884. *v.* p. 177
B = $C_{10}H_8$
Naphthalene

885. *v.* p. 177
B = $C_{10}H_9N$
α-Naphthylamine

886. *v.* p. 177
B = $C_{10}H_9N$
β-Naphthylamine

887. (108, 253)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 45.0 | 100 |
| A + B | |
| 12.0E | 45 |
| B | |
| 178.0 | 0 |

888. (234)
B = $C_{10}H_{16}O$
Fenchone

| °C | Wt. % A |
|---|---|
| A | |
| +44.5 | 100 |
| A + B | |
| extp. | 92 |
| − 5.0E | |
| B | |
| vis. | 30 to 15 |
| + 5.3 | 0 |

889. (36)
B = $C_{10}H_{18}O$
Cineole

| | |
|---|---|
| A | |
| +44.0 | 100 |
| A + B | |
| − 6.0E | 13 |
| B | |
| + 1.0 | 0 |

890. (238)
B = $C_{11}H_{12}N_2O$
Antipyrine

| | |
|---|---|
| A | |
| 43.5 | 100 |
| A + B | |
| 13.0E | 53 |
| B | |
| 109.8 | 0 |

891. *v.* p. 177
B = $C_{12}H_9N$
Carbazole

892. (239)
B = $C_{12}H_{10}$
Acenapthene

| °C | Wt. % A |
|---|---|
| A | |
| 44.5 | 100 |
| A + B | |
| 32.0E | 77 |
| B | |
| 90.5 | 0 |

892.1 (274.2)
B = $C_{12}H_{10}N_2$
Azobenzene

| | |
|---|---|
| A | |
| 44.0 | 100 |
| A + B | |
| 29.0E | 60.0 |
| B | |
| 67 | 0 |

**$C_6H_5NO_3$.—** (*Continued*)

893. (138, 261)
B = $C_{13}H_{11}N$
Diphenylamine

| °C | Wt. % A |
|---|---|
| A | |
| 44.5 | 100 |
| A + B | |
| 21.0E | 51 |
| B | |
| 53.1 | 0 |

894. (274)
B = $C_{13}H_{10}O$
Benzophenone

| | |
|---|---|
| A | |
| 45.0 | 100 |
| A + B | |
| 16.0E | 45 |
| B | |
| 47.0 | 0 |

894.1. (234.1)
B = $C_{13}H_{12}O$
Benzhydrol

| | |
|---|---|
| A | |
| 44.5 | 100 |
| A + B | |
| 29.0E | 61.0 |
| B | |
| 64.5 | 0 |

895. (252)
B = $C_{14}H_{10}$
Anthracene

| | |
|---|---|
| A | |
| 44.5 | 100 |
| A + B | |
| 44.0E | 98 |
| B | |
| 66.5 | 95 |
| 93.0 | 90 |
| 125.0 | 80 |
| 144.0 | 70 |
| 158.0 | 60 |
| 170.0 | 50 |
| 180.0 | 40 |
| 189.5 | 30 |
| 197.5 | 20 |
| 205.0 | 10 |
| 212.0 | 0 |

896. (254)
B = $C_{19}H_{16}$
Triphenylmethane

| | |
|---|---|
| A | |
| 45.0 | 100 |
| A + B | |
| 36.0E | 70 |
| B | |
| 91.0 | 0 |

898. (243)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| A | |
| 44.7 | 100 |
| A + B | |
| 41.0E | 90 |

898.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 159.5 | 0 |

*v. also* 124, 243, 295, 321, 371, 441, 459.2, 477, 497, 586, 772, 1860, 1861

**$C_6H_5NO_3$**
*m*-Nitrophenol
899. *v.* p. 177
B = $C_6H_5NO_3$
*p*-Nitrophenol
*v. also* 1861

900. (48, 71)
B = $C_6H_6$

| °C | Wt. % B |
|---|---|
| 95.2 | 0 |
| 91.0 | 5 |
| 87.7 | 10 |
| 82.0 | 20 |
| 77.8 | 30 |
| 75.4 | 40 |
| 73.5 | 50 |
| 71.0 | 60 |
| 68.3 | 70 |
| 63.5 | 80 |
| 52.0 | 90 |
| 39.5 | 95 |
| 15.0 | 99 |
| 0.0 | 99.5 |

901. (259)
B = $C_6H_7N$
Aniline

| °C | Mol % A |
|---|---|
| A | |
| 96.0 | 100.0 |
| 82.0 | 80.5 |
| 60.0 | 62.2 |
| 36.0 | 51.1 |
| A + AB | |
| *ca.* 23.0U | 45.0 |
| AB | |
| 22.5 | 43.2 |
| 20.5 | 39.3 |
| 13.0 | 31.5 |
| + 6.5 | 27.6 |
| AB + B | |
| −15E | 20 |
| B | |
| −10.0 | 9.7 |
| − 7.0 | 2.7 |
| − 6.3 | 0.0 |

902. (247)
B = $C_6H_7NO$
*m*-Aminophenol

| °C | Wt. % A |
|---|---|
| A | |
| 94.5 | 100 |
| A + B | |
| 66.0E | 66 |
| B | |
| 118.5 | 0 |

903. (257)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| °C | Wt. % A |
|---|---|
| A | |
| 95.0 | 100 |
| 85.3 | 90 |
| A + $A_2B$ | |
| 73.5E | 81.5 |
| $A_2B$ | |
| **73.9** | **72** |
| 69.8 | 60 |
| $A_2B$ + AB | |
| 63.2U | 55 |
| AB + B | |
| 63.1E | 47 |
| B | |
| 73.3 | 40 |
| 82.3 | 30 |
| 89.9 | 20 |
| 95.8 | 10 |
| 101.0 | 0 |

904. (257)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| | |
|---|---|
| A | |
| 95.0 | 100 |
| 91.3 | 90 |
| A + $A_2B$ | |
| 71.0E | 82 |
| $A_2B$ | |
| **74.5** | **72** |
| $A_2B$ + AB | |
| 74.0E | 68 |
| AB | |
| 74.4 | 60 |
| **80.3** | **56.3** |
| 79.8 | 50 |
| 84.1 | 40 |
| 72.9 | 30 |
| AB + $AB_4$ | |
| 52.0U | 22.5 |
| $AB_4$ + B | |
| 51.0E | 18 |
| B | |
| 56.2 | 9.6 |
| 62.1 | 0 |

905. (257)
B = $C_6H_8N_2$
*p*-Phenylenediamine

| | |
|---|---|
| A | |
| 95.0 | 100 |
| A + $A_2B$ | |
| 93.2E | 97 |
| $A_2B$ | |
| 121.5 | 90 |
| 135.4 | 80 |
| **137.8** | **72** |
| 133.6 | 60 |
| 124.7 | 50 |
| $A_2B$ + $AB_2$ | |
| 112.0U | 39.2 |
| $AB_2$ + B | |
| 111.0E | 35.5 |

905.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 127.3 | 20 |
| 134.0 | 10 |
| 140.0 | 0 |

906. (231)
B = $C_7H_7NO$
Benzamide

| | |
|---|---|
| A | |
| 95.0 | 100 |
| A + AB | |
| 38.7E | 63 |
| AB + B | |
| 38.7U | 57 |
| B | |
| 124.8 | 0 |

907. (428)
B = $C_7H_8$
Toluene

| °C | Wt. % B |
|---|---|
| 95.2 | 0 |
| 91.2 | 5 |
| 88.0 | 10 |
| 82.5 | 20 |
| 78.3 | 30 |
| 76.0 | 40 |
| 74.5 | 50 |
| 73.0 | 60 |
| 71.0 | 70 |
| 67.5 | 80 |
| 56.0 | 90 |
| 42.0 | 95 |

908. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| °C | Mol % A |
|---|---|
| A | |
| 95.3 | 100 |
| 92.5 | 95 |
| 88.1 | 90 |
| 82.2 | 85 |
| 73.9 | 80 |
| 63.4 | 75 |
| 50.6 | 70 |
| A + AB | |
| 44.0E | 67 |
| AB | |
| 60.2 | 60 |
| 66.3 | 55 |
| **68.8** | **50** |
| AB + B | |
| 66.0E | 42.3 |
| B | |
| 77.3 | 40 |
| 92.8 | 35 |
| 103.6 | 30 |
| 111.3 | 25 |
| 117.8 | 20 |
| 122.7 | 15 |
| 126.5 | 10 |
| 132.1 | 0 |

909. (256)
B = $C_7H_9N$
*p*-Toluidine

909.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 94.8 | 100 |
| A + AB | |
| 35.0E | 64 |
| AB | |
| **36.5** | **56** |
| AB + B | |
| 23.0E | 35 |
| B | |
| 42.5 | 0 |

910. (249)
B = $C_8H_8O$
Acetophenone

| | |
|---|---|
| A | |
| +95.0 | 100 |
| A + B | |
| −16.0E | 41.5 |
| B | |
| +20.5 | 0 |

910.1. (274.1)
B = $C_9H_8O_2$
Cinnamic acid

| | |
|---|---|
| A | |
| 95.0 | 100 |
| A + AB? | |
| 77.5E | ? |
| AB? | |
| **77.5** | **74–61** |
| AB? + B | |
| 77.5E | ? |
| B | |
| 133.0 | 0 |

911. (237)
B = $C_{10}H_9N$
α-Naphthylamine

| | |
|---|---|
| A | |
| 96.0 | 100 |
| 90.7 | 90 |
| 83.1 | 80 |
| 74.5 | 70 |
| 64.8 | 60 |
| A + AB | |
| 56.0E | 51.2 |
| AB | |
| **56.3** | **50.7** |
| 53.7 | 40 |
| 46.6 | 30 |
| AB + B | |
| 33.5E | 16.5 |
| B | |
| 39.9 | 10 |
| 48.0 | 0 |

912. (237)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| A | |
| 96.0 | 100 |
| 91.6 | 90 |
| 84.0 | 80 |
| 73.7 | 70 |
| A + AB | |
| 61.5E | 60.5 |

912.—(*Continued*)

| °C | Wt. % A |
|---|---|
| AB | |
| **64.3** | **56** |
| AB + B | |
| 64.2E | 48.5 |
| B | |
| 75.7 | 40 |
| 87.0 | 30 |
| 95.2 | 20 |
| 102.5 | 10 |
| 109.0 | 0 |

913. (108, 253)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 95.5 | 100 |
| A + B | |
| 16.0E | 41.5 |
| B | |
| 178.0 | 0 |

914. (36)
B = $C_{10}H_{18}O$
Cineole

| °C | Wt. % A |
|---|---|
| A | |
| 96 | 100 |
| A + B | |
| −15.0E | 23.5 |
| B | |
| + 1.0 | 0 |

915. (238)
B = $C_{11}H_{12}N_2O$
Antipyrine

| | |
|---|---|
| A | |
| 94.8 | 100 |
| 47.0 | 65.8 |
| vis. | 65.8 to 28.5 |
| B | |
| 42.8 | 28.5 |
| 109.8 | 0.0 |

916. *v.* p. 177
B = $C_{12}H_9N$
Carbazole

917. (239)
B = $C_{12}H_{10}$
Acenaphthene

| | |
|---|---|
| A | |
| 94.8 | 100 |
| A + B | |
| 73.5E | 53.0 |
| B | |
| 90.5 | 0.0 |

917.1. (274.2)
B = $C_{12}H_{10}N_2$
Azobenzene

| | |
|---|---|
| A | |
| 95.0 | 100 |
| A + B | |
| 58.0E | 24 |
| B | |
| 67 | 0 |

**918.** (261)
B = $C_{12}H_{11}N$
Diphenylamine

| °C | Wt. % A |
|---|---|
| A | |
| 94.5 | 100 |
| A + B | |
| 44.0E | 18.0 |
| B | |
| 52.0 | 0.0 |

**919.** (274)
B = $C_{13}H_{10}O$
Benzophenone

| | |
|---|---|
| A | |
| 95.8 | 100 |
| A + B | |
| 12.0E | 38.5 |
| B | |
| 47.0 | 0.0 |

**920.** (235)
B = $C_{13}H_{12}$
Diphenylmethane

| | |
|---|---|
| A | |
| 94.8 | 100 |
| A + B | |
| 22.0E | 3.0 |
| B | |
| 24.0 | 0.0 |

**920.1.** (234.1)
B = $C_{13}H_{12}O$
Benzhydrol

| | |
|---|---|
| A | |
| 95.0 | 100 |
| A + B | |
| 38.0E | 30.0 |
| B | |
| 64.5 | 0 |

**921.** (252)
B = $C_{14}H_{10}$
Anthracene

| | |
|---|---|
| A | |
| 95.5 | 100 |
| A + AB | |
| 93.0E | 97 |
| AB | |
| 105.0 | 95 |
| 128.0 | 90 |
| 150.5 | 80 |
| 164.5 | 70 |
| 175.0 | 60 |
| 183.0 | 50 |
| **186.5** | **43.5** |
| AB + B | |
| 186.0E | 41 |
| B | |
| 186.8 | 40 |
| 195.5 | 30 |
| 203.0 | 20 |
| 208.3 | 10 |
| 212.5 | 0 |

**922.** (254)
B = $C_{19}H_{16}$
Triphenylmethane

| | |
|---|---|
| A | |
| 96.0 | 100 |

**922.**—(*Continued*)

| °C | Wt. % A |
|---|---|
| A + B | |
| 80.0E | 24 |
| B | |
| 91.0 | 0 |

**923.** (243)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| A | |
| 95.5 | 100 |
| A + $A_2B$ | |
| 84.0E | 70 |
| $A_2B$ + B | |
| 85.0U | 60 |
| B | |
| 159.0 | 0 |

*v. also* 125, 296, 322, 372, 442, 458.3, 459.3, 478, 498, 587, 869, 1860, 1861

*

**$C_6H_5NO_3$**
*p*-Nitrophenol
**924.** (48, 71)
B = $C_6H_6$

| °C | Wt. % A |
|---|---|
| 114.0 | 100 |
| 108.0 | 95 |
| 103.7 | 90 |
| 97.7 | 80 |
| 94.0 | 70 |
| 91.5 | 60 |
| 89.0 | 50 |
| 86.0 | 40 |
| 83.0 | 30 |
| 78.5 | 20 |
| 68.5 | 10 |
| 56.0 | 5 |
| 20.0 | 1 |
| 8.0 | 0.5 |

**925.** (259)
B = $C_6H_7N$
Aniline

| °C | Mol % A |
|---|---|
| A | |
| 113.0 | 100.0 |
| 86.5 | 72.2 |
| 67.0 | 59.7 |
| 49.0 | 52.8 |
| A + AB | |
| **42.0UE** | **50.0** |
| AB | |
| 42.0 | 42.3 |
| 38.5 | 36.2 |
| 20.0 | 22.1 |
| + 4.0 | 16.0 |
| AB + B | |
| −20.5E | 10.5 |
| B | |
| −17.5 | 9.3 |
| −10.5 | 3.4 |
| − 6.3 | 0.0 |

**926.** (247)
B = $C_6H_7NO$
*m*-Aminophenol

| °C | Wt. % A |
|---|---|
| A | |
| 111.5 | 100 |
| A + AB | |
| 81.0E | 70 |
| AB | |
| **85.0** | **56** |
| AB + B | |
| 83.0E | 51 |
| B | |
| 118.0 | 0 |

**927.** (257)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| | |
|---|---|
| A | |
| 111.5 | 100 |
| 100.2 | 90 |
| A + $A_2B$ | |
| 85.5E | 81 |
| $A_2B$ | |
| **87.9** | **72** |
| 82.7 | 60 |
| 71.7 | 50 |
| $A_2B$ + B | |
| 68.0E | 45.5 |
| B | |
| 73.5 | 40 |
| 82.3 | 30 |
| 90.0 | 20 |
| 96.0 | 10 |
| 101.0 | 0 |

**928.** (257)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| | |
|---|---|
| A | |
| 111.5 | 100 |
| A + $A_2B$ | |
| 102.0E | 91 |
| $A_2B$ | |
| 116.8 | 80 |
| **119.9** | **72** |
| 114.8 | 60 |
| 105.0 | 50 |
| 91.5 | 40 |
| 73.0 | 30 |
| $A_2B$ + B | |
| 52.4E | 20 |
| B | |
| 57.2 | 10 |
| 62.0 | 0 |

**929.** (257)
B = $C_6H_8N_2$
*p*-Phenylenediamine

| | |
|---|---|
| A | |
| 111.5 | 100 |
| A + $A_4B$ | |
| 109.5E | 98 |
| $A_4B$ | |
| 129.0 | 90 |
| **134.2** | **83.2** |
| 126.5 | 70 |

**929.**—(*Continued*)

| °C | Wt. % A |
|---|---|
| $A_4B$ + AB | |
| 117.4E | 58 |
| AB | |
| **117.5** | **56** |
| 116.5 | 50 |
| AB + B | |
| 107.0E | 38 |
| B | |
| 117.5 | 30 |
| 127.3 | 20 |
| 134.1 | 10 |
| 140.0 | 0 |

**930.** (258)
B = $C_7H_6O_2$
*m*-Hydroxybenzaldehyde

| | |
|---|---|
| A | |
| 113.5 | 100 |
| A + B | |
| 65.8E | 51 |
| B | |
| 105.0 | 0 |

**931.** (231)
B = $C_7H_7NO$
Benzamide

| | |
|---|---|
| A | |
| 112.0 | 100 |
| A + AB | |
| 81.6E | 74 |
| AB | |
| **97.2** | **53.4** |
| AB + B | |
| 90.3E | 36 |
| B | |
| 124.8 | 0 |

**932.** (428)
B = $C_7H_8$
Toluene

| | |
|---|---|
| 114.0 | 100 |
| 109.3 | 95 |
| 105.5 | 90 |
| 100.2 | 80 |
| 96.3 | 70 |
| 93.5 | 60 |
| 91.0 | 50 |
| 88.7 | 40 |
| 85.8 | 30 |
| 81.2 | 20 |
| 72.5 | 10 |
| 60.0 | 5 |

**933.** (208)
B = $C_7H_8O_2$
Dimethylpyrone

| °C | Mol % A |
|---|---|
| A | |
| 113.8 | 100 |
| 109.7 | 95 |
| 104.2 | 90 |
| 97.0 | 85 |
| 87.5 | 80 |
| 75.3 | 75 |

**933.**—(*Continued*)

| °C | Mol % A |
|---|---|
| A + $A_2B$ | |
| 57.0E | 70 |
| $A_2B$ | |
| **58.2** | **66.7** |
| $A_2B$ + AB | |
| 57.0E | 62.2 |
| AB | |
| 68.5 | 55 |
| **72.3** | **50** |
| 70.3 | 45 |
| AB + B | |
| 68.0E | 42 |
| B | |
| 92.8 | 35 |
| 103.5 | 30 |
| 111.5 | 25 |
| 118.0 | 20 |
| 123.0 | 15 |
| 126.7 | 10 |
| 132.1 | 0 |

**934.** (256)
B = $C_7H_9N$
*p*-Toluidine

| °C | Wt. % A |
|---|---|
| A | |
| 111.4 | 100 |
| A + $A_2B$ | |
| 58.0U | 67 |
| $A_2B$ + AB | |
| 24.5U | 44 |
| AB + B | |
| 20.0E | 30 |
| B | |
| 42.5 | 0 |

**935.** (249)
B = $C_8H_8O$
Acetophenone

| | |
|---|---|
| A | |
| +112.0 | 100 |
| A + B | |
| − 4.0E | 38 |
| B | |
| + 20.5 | 0 |

**935.1.** (274.1)
B = $C_9H_8O_2$
Cinnamic acid

| | |
|---|---|
| A | |
| 114.0 | 100 |
| A + B | |
| 83.0E | 61.0 |
| B | |
| 133.0 | 0 |

**936.** (222)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % A |
|---|---|
| A | |
| 113.0 | 100 |
| 107.3 | 90 |
| 101.7 | 80 |
| 96.2 | 70 |
| 91.6 | 60 |
| 86.8 | 50 |

**936.**—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 82.0 | 40 |
| 76.7 | 30 |
| A + B | |
| 74.0E | 25 |
| B | |
| 74.6 | 20 |
| 77.0 | 10 |
| 80.1 | 0 |

**937.** (237)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 112.0 | 100 |
| 105.8 | 90 |
| 97.0 | 80 |
| 86.2 | 70 |
| 73.0 | 60 |
| A + AB | |
| 66.0E | 55.5 |
| AB | |
| **68.2** | **49.3** |
| 66.9 | 40 |
| 60.0 | 30 |
| 46.5 | 20 |
| AB + B | |
| 36.5E | 14.5 |
| B | |
| 40.8 | 10 |
| 48.0 | 0 |

*

**938.** (237)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| A | |
| 112.0 | 100 |
| 103.5 | 90 |
| 94.5 | 80 |
| 84.3 | 70 |
| A + AB | |
| 78.0E | 65 |
| AB | |
| 79.8 | 60 |
| **81.0** | **49.3** |
| 79.6 | 40 |
| AB + B | |
| 78.2E | 36 |
| B | |
| 84.0 | 30 |
| 93.5 | 20 |
| 101.9 | 10 |
| 109.0 | 0 |

**939.** (108, 253)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| +114.1 | 100 |
| A + B | |
| − 2.0E | 36 |
| B | |
| +178.0 | 0 |

**$C_6H_5NO_3$.—**
*(Continued)*

940. (234)
B = $C_{10}H_{16}O$
Fenchone

| °C | Wt. % A |
|---|---|
| +115.0 | 100 |
| − 6.0 | 38.1 |
| vis. | 38.1 to 12.6 |
| − 2.8 | 12.6 |
| + 5.3 | 0.0 |

941. (36)
B = $C_{10}H_{18}O$
Cineole

| A | |
|---|---|
| +114.0 | 100 |
| A + B | |
| − 16.0E | 23 |
| B | |
| + 1.0 | 0 |

942. (238)
B = $C_{11}H_{12}N_2O$
Antipyrine

| A | |
|---|---|
| 111.5 | 100 |
| A + $A_2B$ | |
| 67.0E | 72 |
| $A_2B$ | |
| **79.0** | **59.6** |
| $A_2B$ + AB | |
| 78.5E | 56.5 |
| AB | |
| **99.5** | **42.5** |
| AB + $AB_2$ | |
| 80.0E | 27 |
| $AB_2$ + B | |
| 79.0E | 23 |
| B | |
| 109.8 | 0 |

943. *v.* p. 177
B = $C_{12}H_9N$
Carbazole

944. (239)
B = $C_{12}H_{10}$
Acenaphthene

| °C | Wt. % A |
|---|---|
| A | |
| 111.8 | 100 |
| A + B | |
| 80.0E | 33 |
| B | |
| 90.5 | 0 |

944.1. (274.2)
B = $C_{12}H_{10}N_2$
Azobenzene

| A | |
|---|---|
| 113.5 | 100 |
| A + B | |
| 49.0E | 10.0 |
| B | |
| 67 | 0 |

945. (261)
B = $C_{12}H_{11}N$
Diphenylamine

| °C | Wt. % A |
|---|---|
| A | |
| 111.5 | 100 |
| A + B | |
| 47.0E | 10 |
| B | |
| 52.0 | 0 |

946. (274)
B = $C_{13}H_{10}O$
Benzophenone

| A | |
|---|---|
| 112.7 | 100 |
| A + B | |
| 17.0E | 34 |
| B | |
| 47.0 | 0 |

947. (235)
B = $C_{13}H_{12}$
Diphenylmethane

| A | |
|---|---|
| 111.6 | 100 |
| A + B | |
| 23.0E | 1 |
| B | |
| 23.9 | 0 |

947.1. (234.1)
B = $C_{13}H_{12}O$
Benzhydrol

| A | |
|---|---|
| 114.5 | 100 |
| A + B | |
| 36.0E | 27.0 |
| B | |
| 6.45 | 0 |

948. *v.* p. 177
B = $C_{14}H_{10}$
Anthracene

949. (254)
B = $C_{19}H_{16}$
Triphenylmethane

| °C | Wt. % A |
|---|---|
| A | |
| 112.5 | 100 |
| A + B | |
| 86.0E | 7.5 |
| B | |
| 91.0 | 0.0 |

950. (243)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| A | |
|---|---|
| 111.5 | 100 |
| A + B | |
| 97.0E | 63 |
| B | |
| 159.5 | 0 |

*v. also* 126, 244, 297, 323, 373, 443, 458.4, 459.4, 479, 499, 588, 821, 870, 899, 1860, 1861

**$C_6H_5NO_4$**
Nitrocatechol

951. (108)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 83.8 | 100 |
| A + B | |
| 26.0E | 38 |
| B | |
| 178.0 | 0 |

**$C_6H_5NO_4$**
Nitroresorcinol

952. (108)
B = $C_{10}H_{16}O$
Camphor

| A | |
|---|---|
| 84.8 | 100 |
| A + B | |
| 46.3E | 39.3 |
| B | |
| 178.0 | 0 |

**$C_6H_5NO_4$**
Nitrohydroquinol

953. (108)
B = $C_{10}H_{16}O$
Camphor

| A | |
|---|---|
| 131.3 | 100 |
| A + B | |
| 26.5E | 33.2 |
| B | |
| 178.0 | 0 |

**$C_6H_5N_3O_4$**
2, 4-Dinitroaniline

954. *v.* p. 177
B = $C_6H_6N_2O_2$
*o*-Nitroaniline

955. *v.* p. 177
B = $C_6H_6N_2O_2$
*p*-Nitroaniline

**$C_6H_6$**

956. (427)
B = $C_6H_6ClN$
*o*-Chloroaniline

| °C | Wt. % A |
|---|---|
| A | |
| 5.5 | 100 |
| + 1.25 | 90 |
| − 2.9 | 80 |
| − 7.5 | 70 |
| −12.2 | 60 |
| −17.0 | 50 |
| −22.5 | 40 |
| A + B | |
| −25.0E | 31.5 |
| B | |
| −17.2 | 20 |
| − 9.4 | 10 |
| − 2.1 | 0 |

957. (427)
B = $C_6H_6ClN$
*m*-Chloroaniline

957.—*(Continued)*

| °C | Wt. % A |
|---|---|
| A | |
| 5.5 | 100 |
| + 1.1 | 90 |
| − 3.4 | 80 |
| − 8.0 | 70 |
| −12.7 | 60 |
| −17.5 | 50 |
| −22.2 | 40 |
| A + B | |
| −29.0E | 24.5 |
| B | |
| −25.8 | 20 |
| −18.0 | 10 |
| −10.4 | 0 |

958. (427)
B = $C_6H_6ClN$
*p*-Chloroaniline

| A | |
|---|---|
| 5.5 | 100 |
| A + B | |
| 1.5E | 91.5 |
| B | |
| 12.7 | 80 |
| 22.2 | 70 |
| 30.7 | 60 |
| 38.2 | 50 |
| 44.8 | 40 |
| 50.9 | 30 |
| 56.8 | 20 |
| 63.1 | 10 |
| 70.5 | 0 |

959. (48, 427)
B = $C_6H_6N_2O_2$
*o*-Nitroaniline

| A | |
|---|---|
| 5.5 | 100 |
| A + B | |
| 2.5E | 92 |
| B | |
| 21.0 | 80 |
| 32.4 | 70 |
| 38.9 | 60 |
| 43.5 | 50 |
| 47.5 | 40 |
| 50.8 | 30 |
| 55.8 | 20 |
| 62.8 | 10 |
| 71.1 | 0 |

960. (48, 427)
B = $C_6H_6N_2O_2$
*m*-Nitroaniline

| A | |
|---|---|
| 5.5 | 100 |
| A + B | |
| 5.3E | *ca.* 99.8 |
| B | |
| 40.0 | 95 |
| 52.0 | 90 |
| 69.5 | 80 |
| 77.2 | 70 |
| 82.0 | 60 |
| 85.8 | 50 |
| 89.4 | 40 |

960.—*(Continued)*

| °C | Wt. % A |
|---|---|
| B | |
| 93.7 | 30 |
| 98.6 | 20 |
| 105.5 | 10 |
| 114.6 | 0 |

961. (48, 427)
B = $C_6H_6N_2O_2$
*p*-Nitroaniline

| A | |
|---|---|
| 5.5 | 100 |
| A + B | |
| 5.4E | 99.9 |
| B | |
| 81.0 | 95 |
| 92.5 | 90 |
| 105.0 | 80 |
| 111.5 | 70 |
| 115.3 | 60 |
| 118.3 | 50 |
| 121.1 | 40 |
| 125.0 | 30 |
| 131.0 | 20 |
| 138.5 | 10 |
| 147.0 | 0 |

962. *v.* p. 177
B = $C_6H_6O$
Phenol

963. (408)
B = $C_6H_7N$
Aniline

| | |
|---|---|
| −6.0 | 0 |
| −7.18 | 1 |
| −8.0 | 2 |
| −8.70 | 3 |
| −9.30 | 4 |

964. (423.5)
B = $C_6H_7NO$
*o*-Aminophenol

| | |
|---|---|
| 177.0 | 0 |
| 170.0 | 10 |
| 165.0 | 20 |
| 161.5 | 30 |
| 158.5 | 40 |
| 155.8 | 50 |
| 153.2 | 60 |
| 149.8 | 70 |
| 145.0 | 80 |
| 134.0 | 90 |
| 120.0 | 95 |

965. (423.5)
B = $C_6H_7NO$
*m*-Aminophenol

| B | |
|---|---|
| 122.1 | 0.0 |
| 116.4 | 8.2 |
| 112.6 | 17.4 |
| Two liquid phases | |
| 110.6 Trp. | 30.6 83.5 |
| 118 | 45 76 |
| 119 | 46 74 |
| 120 | 47 73 |
| 121 | 48 69 |
| 122.3 crit. | 60.0 |

965.—*(Continued)*

| °C | Wt. % A |
|---|---|
| B | |
| 105.9 | 89.6 |
| 96.5 | 95.1 |

966. (423.5)
B = $C_6H_7NO$
*p*-Aminophenol

| | |
|---|---|
| 186.0 | 0 |
| 174.0 | 10 |
| 163.0 | 20 |
| 154.7 | 30 |
| 148.6 | 40 |
| 144.8 | 50 |
| 141.5 | 60 |
| 139.0 | 70 |
| 135.0 | 80 |
| 128.0 | 90 |
| 116.5 | 95 |

966.1. (426.1)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| B | |
|---|---|
| 31.0 | 97.5 |
| 46.0 | 95 |
| 59.8 | 90 |
| 70.7 | 80 |
| 76.1 | 70 |
| 80.0 | 60 |
| 82.7 | 50 |
| 85.1 | 40 |
| 88.2 | 30 |
| 92.0 | 20 |
| 97.0 | 10 |
| 103.8 | 0 |

966.2. (426.1)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| B | |
|---|---|
| 19.0 | 99 |
| 31.2 | 97.5 |
| 42.0 | 95 |
| 51.0 | 90 |
| 53.8 | 86 to 25 |
| 54.8 | 20 |
| 57.9 | 10 |
| 62.8 | 0 |
| Immiscible liquids | |
| 53.8 | 86 −25 |
| 60.0 | 80.4–29 |
| 65.0 | 74 −35 |
| 69.0 crit. | 45 |

966.3. (426.1)
B = $C_6H_8N_2$
*p*-Phenylenediamine

| B | |
|---|---|
| 50 *ca.* | 99 |
| 74.0 | 97.5 |
| 87.0 | 95 |
| 99.0 | 90 |
| 110.5 | 80 |
| 112.8 | 70 |
| 113.9 | 60 |
| 115.2 | 50 |
| 117.2 | 40 |

966.3.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 120.3 | 30 |
| 125.0 | 20 |
| 131.8 | 10 |
| 139.7 | 0 |

967. (325)
B = $C_6H_{12}$
Cyclohexane

| A | |
|---|---|
| 5.0 | 100 |
| + 1.6 | 95 |
| − 1.4 | 90 |
| − 6.9 | 80 |
| −12.4 | 70 |
| −18.4 | 60 |
| −25.0 | 50 |
| −32.2 | 40 |
| −39.5 | 30 |
| A + B | |
| −43.7E | 24.2 |
| B | |
| −33.8 | 20 |
| −13.1 | 10 |
| − 3.5 | 5 |
| + 6.2 | 0 |

968. *v.* p. 177
B = $C_8H_{12}O_3$
Paraldehyde

969. *v.* p. 177
B = $C_7H_5ClO$
Benzoyl chloride

970. (426)
B = $C_7H_5ClO_2$
*o*-Chlorobenzoic acid

| | |
|---|---|
| 140.3 | 0 |
| 134.0 | 5 |
| 128.5 | 10 |
| 113.0 | 30 |
| 106.0 | 40 |
| 99.0 | 50 |
| 92.0 | 60 |
| 84.5 | 70 |
| 75.0 | 80 |
| 58.5 | 90 |
| 41.0 | 95 |
| 5.5 | 100 |

971. (426)
B = $C_7H_5ClO_2$
*m*-Chlorobenzoic acid

| | |
|---|---|
| 154.5 | 0 |
| 148.0 | 5 |
| 142.5 | 10 |
| 133.0 | 20 |
| 124.5 | 30 |

971.—(*Continued*)

| °C | Wt. % A |
|---|---|
| 116.0 | 40 |
| 108.5 | 50 |
| 101.5 | 60 |
| 93.5 | 70 |
| 84.0 | 80 |
| 67.5 | 90 |
| 50.0 | 95 |
| 5.5 | 100 |

972. (426)
B = $C_7H_5ClO_2$
*p*-Chlorobenzoic acid

| | |
|---|---|
| 241.5 | 0 |
| 235.5 | 5 |
| 230.0 | 10 |
| 220.0 | 20 |
| 210.0 | 30 |
| 200.5 | 40 |
| 191.5 | 50 |
| 182.5 | 60 |
| 172.0 | 70 |
| 157.0 | 80 |
| 136.5 | 90 |
| 117.0 | 95 |
| 5.5 | 100 |

973. (425)
B = $C_7H_5NO_3$
*o*-Nitrobenzaldehyde

| A | |
|---|---|
| 5.5 | 100 |
| +2.8 | 90 |
| −0.3 | 80 |
| A + B | |
| −2.0E | 74.5 |
| B | |
| +1.4 | 70 |
| 7.9 | 60 |
| 13.6 | 50 |
| 18.9 | 40 |
| 24.0 | 30 |
| 29.3 | 20 |
| 35.4 | 10 |
| 43.5 | 0 |

974. (425)
B = $C_7H_5NO_3$
*m*-Nitrobenzaldehyde

| A | |
|---|---|
| 5.5 | 100 |
| A + B | |
| 1.0E | 84 |
| B | |
| 6.0 | 80 |
| 15.8 | 70 |
| 22.1 | 60 |
| 27.3 | 50 |
| 31.8 | 40 |
| 36.9 | 30 |
| 42.2 | 20 |
| 48.3 | 10 |
| 58.0 | 0 |

975. (425)
B = $C_7H_5NO_3$
*p*-Nitrobenzaldehyde

| A | |
|---|---|
| 5.5 | 100 |
| A + B | |
| 4.1E | 96.4 |
| B | |
| 30.3 | 90 |
| 47.8 | 80 |
| 57.8 | 70 |
| 65.2 | 60 |
| 71.5 | 50 |
| 77.0 | 40 |
| 82.5 | 30 |
| 88.6 | 20 |
| 96.0 | 10 |

976. (426)
B = $C_7H_5NO_4$
*o*-Nitrobenzoic acid

| | |
|---|---|
| 146.8 | 0 |
| 141.5 | 5 |
| 136.5 | 10 |
| 127.5 | 20 |
| 120.5 | 30 |
| 116.0 | 40 |
| 113.0 | 50 |
| 110.0 | 60 |
| 106.5 | 70 |
| 101.0 | 80 |
| 90.5 | 90 |
| 78.5 | 95 |
| 5.5 | 100 |

977. (426)
B = $C_7H_5NO_4$
*m*-Nitrobenzoic acid

| | |
|---|---|
| 141.4 | 0 |
| 135.5 | 5 |
| 130.5 | 10 |
| 121.3 | 20 |
| 114.0 | 30 |
| 107.5 | 40 |
| 102.0 | 50 |
| 96.0 | 60 |
| 89.0 | 70 |
| 81.0 | 80 |
| 65.5 | 90 |
| 48.0 | 95 |
| 5.5 | 100 |

978. (426)
B = $C_7H_5NO_4$
*p*-Nitrobenzoic acid

| | |
|---|---|
| 242.4 | 0 |
| 236.5 | 5 |
| 230.5 | 10 |
| 220.0 | 20 |
| 210.5 | 30 |
| 204.5 | 40 |
| 201.5 | 50 |

978.—(*Continued*)

| °C | Wt. % A |
|---|---|
| 199.5 | 60 |
| 194.0 | 70 |
| 182.5 | 80 |
| 165.5 | 90 |
| 5.5 | 100 |

979. *v.* p. 177
B = $C_7H_6ClNO_2$
Nitrobenzyl chloride

980. *v.* p. 177
B = $C_7H_6N_2O_4$
2, 4-Dinitrotoluene

981. *v.* p. 177
B = $C_7H_6N_2O_4$
2, 6-Dinitrotoluene

982. *v.* p. 177
B = $C_7H_6N_2O_4$
3, 4-Dinitrotoluene

982.1. (422)
B = $C_7H_6O_2$
*o*-Hydroxybenzaldehyde

| A | |
|---|---|
| 5.32 | 100 |
| 3.7 | 95 |
| + 1.3 | 90 |
| − 3.0 | 80 |
| − 7.5 | 70 |
| −12.7 | 60 |

982.2. (422)
B = $C_7H_6O_2$
*m*-Hydroxybenzaldehyde

| B | |
|---|---|
| 66.5 | 90 |
| 73.3 | 80 |
| 76.9 | 70 |
| 79.1 | 60 |
| 80.9 | 50 |
| 83.0 | 40 |
| 86.0 | 30 |
| 91.0 | 20 |
| 98.0 | 10 |
| 106.0 | 0 |

982.3. (422)
B = $C_7H_6O_2$
*p*-Hydroxybenzaldehyde

| B | |
|---|---|
| 70.0 | 95 |
| 80.5 | 90 |
| 84.0 | 80 |
| 86.2 | 70 |
| 88.0 | 60 |
| 90.5 | 50 |
| 94.0 | 40 |
| 99.0 | 30 |
| 104.5 | 20 |
| 110.0 | 10 |
| 116.0 | 0 |

983. (76.5)
B = $C_7H_6O_2$
Benzoic acid

| °C | Wt. % A |
|---|---|
| A | |
| 5.5 | 100 |
| A + B | |
| 4.3E | 94.9 |
| B | |
| 22.9 | 90 |
| 42.5 | 80 |
| 55.5 | 70 |
| 65.9 | 60 |
| 75.0 | 50 |
| 83.8 | 40 |
| 92.3 | 30 |
| 101.5 | 20 |
| 110.9 | 10 |
| 121.7 | 0 |

985. (316, 426)
B = $C_7H_6O_3$
Salicylic acid

| °C | Wt. % B |
|---|---|
| 159.0 | 100 |
| 147.0 | 90 |
| 140.0 | 80 |
| 133.5 | 70 |
| 127.5 | 60 |
| 120.5 | 50 |
| 113.5 | 40 |
| 106.0 | 30 |
| 97.5 | 20 |
| 84.0 | 10 |
| 67.0 | 5 |
| 25.0 | 0.91 |

987. (326)
B = $C_7H_6O_3$
*m*-Hydroxybenzoic acid

| | |
|---|---|
| 201.3 | 100 |
| 196.0 | 90 |
| 191.0 | 80 |
| 187.0 | 70 |
| 185.0 | 60 |
| 184.0 | 50 |
| 182.0 | 40 |
| 178.0 | 30 |
| 171.0 | 20 |
| 161.5 | 10 |
| 154.0 | 5 |

989. (426)
B = $C_7H_6O_3$
*p*-Hydroxybenzoic acid

| | |
|---|---|
| 213.0 | 100 |
| 209.0 | 90 |
| 205.0 | 80 |
| 201.5 | 70 |
| 198.5 | 60 |
| 196.5 | 50 |
| 195.5 | 40 |
| 194.5 | 30 |
| 191.0 | 20 |
| 177.5 | 10 |
| 164.0 | 5 |

991. *v.* p. 177
B = $C_7H_7Br$
*p*-Bromotoluene

992. *v.* p. 177
B = $C_7H_8$
Toluene

993. (424)
B = $C_8H_6O_3$
*o*-Aldehydobenzoic acid

| °C | Wt. % B |
|---|---|
| 100.5 | 100 |
| 90.0 | 90 |
| 83.0 | 80 |
| 79.3 | 70 |
| 77.0 | 60 |
| 75.5 | 50 |
| 74.5 | 40 |
| 73.5 | 30 |
| 71.7 | 20 |
| 66.5 | 10 |

994. (424)
B = $C_8H_6O_3$
*m*-Aldehydobenzoic acid

| | |
|---|---|
| 175.0 | 100 |
| 166.0 | 90 |
| 158.5 | 80 |
| 152.8 | 70 |
| 150.2 | 60 |
| 149.7 | 50 |
| 149.6 | 40 |

995. (424)
B = $C_8H_6O_3$
*p*-Aldehydobenzoic acid

| | |
|---|---|
| 250.0 | 100 |
| 170.0 | 2 |
| 110.0 | 1 |

996. (427)
B = $C_8H_8ClNO$
*o*-Chloroacetanilide

| | |
|---|---|
| 86.7 | 100 |
| 78.0 | 90 |
| 70.0 | 80 |
| 62.7 | 70 |
| 55.9 | 60 |
| 49.9 | 50 |
| 44.1 | 40 |
| 37.5 | 30 |
| 29.5 | 20 |
| 11.0 | 10 |

997. (427)
B = $C_8H_8ClNO$
*m*-Chloroacetanilide

| | |
|---|---|
| 76.6 | 100 |
| 68.0 | 90 |
| 60.0 | 80 |
| 52.7 | 70 |
| 46.8 | 60 |
| 40.9 | 50 |
| 34.3 | 40 |
| 27.0 | 30 |
| 15.4 | 20 |

$C_6H_6$.—(*Cont'd*)

998. (427)
B = $C_8H_8ClNO$
*p*-Chloroacetanilide

| °C | Wt. % B |
|---|---|
| 178.4 | 100 |
| 169.5 | 90 |
| 162.0 | 80 |
| 154.8 | 70 |
| 147.5 | 60 |
| 141.0 | 50 |
| 135.5 | 40 |
| 130.5 | 30 |
| 124.5 | 20 |
| 114.5 | 10 |
| 100.5 | 5 |

999. (427)
B = $C_8H_8N_2O_3$
*o*-Nitroacetanilide

| | |
|---|---|
| 93.0 | 100 |
| 83.0 | 90 |
| 77.0 | 80 |
| 72.8 | 70 |
| 69.5 | 60 |
| 66.3 | 50 |
| 62.5 | 40 |
| 58.0 | 30 |
| 50.3 | 20 |
| 38.5 | 10 |

1000. (427)
B = $C_8H_8N_2O_3$
*m*-Nitroacetanilide

| | |
|---|---|
| 154.5 | 100 |
| 140.0 | 90 |
| 133.9 | 80 |
| 129.1 | 70 |
| 125.5 | 60 |
| 124.0 | 50 |
| 122.3 | 40 |
| 120.0 | 30 |
| 116.5 | 20 |
| 99.8 | 10 |

1001. (427)
B = $C_8H_8N_2O_3$
*p*-Nitroacetanilide

| | |
|---|---|
| 215.9 | 100 |
| 200.5 | 90 |
| 190.5 | 80 |
| 184.8 | 70 |
| 181.6 | 60 |
| 179.5 | 50 |
| 178.0 | 40 |
| 177.0 | 30 |
| 174.0 | 20 |
| 163.0 | 10 |
| 149.5 | 5 |

1002. (54)
B = $C_8H_8O$
Acetophenone

| °C | Wt. % A |
|---|---|
| | A |
| + 5.5 | 100 |
| | A + B |
| −16.7E | 53 |

1002.—(*Continued*)

| °C | Wt. % A |
|---|---|
| | B |
| +19.2 | 0 |

1002.1. (422)
B = $C_8H_8O_2$
1-Aldehydo-2-hydroxy-5-methylbenzene

| | |
|---|---|
| | A |
| 5.32 | 100 |
| 4.1 | 95 |
| + 2.1 | 90 |
| − 1.8 | 80 |
| | B |
| + 2.5 | 70 |
| 10.2 | 60 |
| 17.8 | 50 |
| 25.0 | 40 |
| 31.0 | 30 |
| 37.5 | 20 |
| 45.8 | 10 |
| 55.1 | 0 |

1002.2. (422)
B = $C_8H_8O_2$
1-Aldehydo-4-hydroxy-5-methylbenzene

| | |
|---|---|
| | B |
| 60.0 | 95 |
| 71.0 | 90 |
| 76.5 | 80 |
| 80.8 | 70 |
| 83.9 | 60 |
| 86.3 | 50 |
| 90.4 | 40 |
| 96.0 | 30 |
| 102.5 | 20 |
| 110.0 | 10 |
| 117.4 | 0 |

1002.3. (422)
B = $C_8H_8O_2$
1-Aldehydo-4-hydroxy-6-methylbenzene

| | |
|---|---|
| | B |
| 55.0 | 95 |
| 70.0 | 90 |
| 73.0 | 80 |
| 75.0 | 70 |
| 77.0 | 60 |
| 80.0 | 50 |
| 83.5 | 40 |
| 88.0 | 30 |
| 94.0 | 20 |
| 101.0 | 10 |
| 108.9 | 0 |

1002.4. (71.1)
B = $C_8H_9NO$
Acetanilide

| °C | g B per 100 g A |
|---|---|
| 7.0 | 0.50 |
| 25.0 | 1.31 |
| 55.2 | 18.5 |

1003. *v.* p. 177
B = $C_8H_{10}$
*p*-Xylene

1003.1. (426.1)
B = $C_8H_{10}N_2O$
Monoacetyl-*o*-phenylenediamine

| °C | Wt. % A |
|---|---|
| | B |
| 33.0 | 95 |
| 50.3 | 90 |
| 73.0 | 80 |
| 87.0 | 70 |
| 97.0 | 60 |
| 105.5 | 50 |
| 113.5 | 40 |
| 121.4 | 30 |
| 129.1 | 20 |
| 136.8 | 10 |
| 144.8 | 0 |

1003.2. (426.1)
B = $C_8H_{10}N_2O$
Monoacetyl-*m*-phenylenediamine

| | |
|---|---|
| | B |
| 54.0 | 97 |
| 83.0 | 95 |
| 145.0 | 90 |
| 184.9 | 84–22.5 |
| 190 | 20 |
| 201 | 15 |
| 217 | 10 |
| 243 | 5 |
| 279 | 0 |
| Immiscible liquids | |
| 184.9 | 84 –22.5 |
| 200.0 | 82 –25.2 |
| 220 | 78.8–29.4 |
| 240 | 74.2–34.8 |
| 260 | 64.5–44.8 |
| 266 crit. | 55 |

1003.3. (426.1)
B = $C_8H_{10}N_2O$
Monoacetyl-*p*-phenylenediamine

| | |
|---|---|
| | B |
| 116.2 | 92.85 |
| 146.8 | ?−27.0 |
| 149.2 | 20 |
| 154.2 | 10 |
| 160.5 | 0 |
| Immiscible liquids | |
| 146.8 | ?−27.0 |
| 170 | ?−39.5 |
| 180 | 83.5–47.0 |
| 188 crit. | *ca.* 67.0 |

1004.
B = $C_8H_{10}N_4O_2$
Caffeine
*v.* Seidell, p. 186

1005. *v.* p. 177
B = $C_{10}H_8$
Naphthalene

1006. (278)
B = $C_{10}H_8O$

1006.—(*Continued*)
β-Naphthol

| °C | Mol % A |
|---|---|
| | A |
| 5.02 | 100 |
| | A + B |
| 4.33E | 98.97 |
| | B |
| 12.0 | 98.17 |
| 32.5 | 96.4 |
| 67.0 | 85.4 |
| 71.5 | 82.2 |
| 77.4 | 74.9 |
| 87.0 | 60.7 |
| 89.8 | 55.2 |
| 95.3 | 49.2 |
| 106.5 | 28.4 |
| 112.5 | 21.0 |
| 121.0 | 0 |

1006.1. (475)
B = $C_{10}H_9N$
α-Naphthylamine

| | |
|---|---|
| 5.4 | 100 |
| 4.7 | 97.5 |
| 3.7 | 95 |
| +1.4 | 90 |
| −4.5 | 80 |
| +7.7 | 70 |
| 15.0 | 60 |
| 21.7 | 50 |
| 27.6 | 40 |
| 32.5 | 30 |
| 37.5 | 20 |
| 43.3 | 10 |
| 46.4 | 5 |
| 49.4 | 0 |

1006.2. (475)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| 5.4 | 100 |
| 14.0 | 97.5 |
| 31.0 | 95 |
| 48.5 | 90 |
| 63.6 | 80 |
| 75.0 | 70 |
| 82.0 | 60 |
| 110.6 | 0 |

1007. (482)
B = $C_{10}H_{14}N_2$
Nicotine

| | |
|---|---|
| | A |
| + 5.0 | 100.00 |
| − 7.2 | 82.36 |
| − 9.9 | 77.3 |
| −17.5 | 64.53 |
| −46.8 | 39.5 |

1008. *v.* p. 177
B = $C_{10}H_{16}$
Camphene

1008.1. (71.1)
B = $C_{10}H_{16}O$
Camphor

| °C | g B per 100 g A |
|---|---|
| 4.0 | 224.0 |

1008.1.—(*Cont'd*)

| °C | g B per 100 g A |
|---|---|
| 25.0 | 257.0 |
| 56.0 | 357.0 |

1009. (86)
B = $C_{10}H_{20}O$
Menthol

| °C | Mol % A |
|---|---|
| | A |
| 5.34 | 100.00 |
| +2.42 | 92.22 |
| −0.28 | 81.16 |
| | A + B |
| −3.4E | 70.0 |
| | B |
| 0.0 | 62.17 |
| +5.4 | 53.62 |
| 9.9 | 46.99 |
| 18.1 | 34.99 |
| 24.7 | 25.66 |
| 29.7 | 18.28 |
| 35.9 | 8.87 |
| 41.9 | 0.00 |

1010. (475)
B = $C_{12}H_9N$
Carbazole

| °C | g B per 100 g A |
|---|---|
| 10.0 | 0.52 |
| 20.0 | 0.66 |
| 30.0 | 0.92 |
| 40.0 | 1.28 |
| 50.0 | 1.75 |
| 60.0 | 2.30 |
| 70.0 | 3.05 |
| 80.0 | 4.1 |

1011. *v.* p. 177
B = $C_{12}H_{10}$
Diphenyl

1012. *v.* p. 177
B = $C_{12}H_{11}N$
Diphenylamine

1013. *v.* p. 177
B = $C_{12}H_{12}N_2$
Hydrazobenzene

1014. *v.* p. 177
B = $C_{13}H_{10}$
Fluorene

1015. (292)
B = $C_{13}H_{12}O$
Benzhydrol

| °C | Wt. % A |
|---|---|
| | A |
| 5.5 | 100 |
| 4.6 | 95 |
| 3.6 | 90 |
| | A + AB |
| 1.5E | 80 |
| | AB |
| 9.9 | 70 |
| 19.8 | 60 |
| 27.5 | 50 |
| | AB + B |
| 29.5U | 45 |

1015.—(*Continued*)

| °C | Wt. % A |
|---|---|
| | B |
| 33.6 | 40 |
| 41.7 | 30 |
| 49.8 | 20 |
| 57.8 | 10 |
| 65.9 | 0 |

1016. *v.* p. 177
B = $C_{14}H_8O_2$
Anthraquinone

1017. *v.* p. 177
B = $C_{14}H_{10}$
Anthracene

1018. *v.* p. 178
B = $C_{14}H_{10}$
Phenanthrene

1018.1. (71.1)
B = $C_{14}H_{10}O_2$
Benzil

| °C | g B per 100 g A |
|---|---|
| 4.5 | 28.8 |
| 25.0 | 59.0 |
| 64.2 | 269.0 |

1019. (48)
B = $C_{14}H_{14}N_2O_2$
*p*-Azoxyanisole

| °C | Mol % A |
|---|---|
| | A |
| 5.5 | 100 |
| | A + B |
| 4.7E | 98.6 |
| | B |
| 23.0 | 98 |
| 40.5 | 95 |
| 55.5 | 90 |
| 72.0 | 80 |
| 81.5 | 70 |
| 88.5 | 60 |
| 94.0 | 50 |
| 99.0 | 40 |
| 104.0 | 30 |
| 109.0 | 20 |
| 113.5 | 10 |
| 118.0 | 0 |

1020. *v.* p. 178
B = $C_{14}H_{16}N_2$
Hydrazotoluene

1021. *v.* p. 178
B = $C_{14}H_{16}N_2O_2$
Hydrazoanisole

1022. (279)
B = $C_{16}H_{11}N_3O_7$
β-Naphthalene picrate

| | |
|---|---|
| 5.02 | 100 |
| 30 | 99 |
| 100 | 90 |
| 120 | 71 |
| 140 | 39 |
| 157 | 0 |

1023. (292)
B = $C_{17}H_{22}N_2O$
Tetramethyldiaminobenzhydrol

| °C | Wt. % A |
|---|---|
| A | |
| 5.5 | 100 |
| AB | |
| 24.2 | 80 |
| 32.8 | 70 |
| 39.7 | 60 |
| 44.8 | 50 |
| AB + B | |
| 50.0U | 38 |
| B | |
| 62.4 | 30 |
| 76.7 | 20 |
| 88.9 | 10 |
| 98.5 | 0 |

1024. (147, 278, 305)
B = $C_{19}H_{16}$
Triphenylmethane

| °C | Mol % A |
|---|---|
| A | |
| 5.05 | 100 |
| A + AB | |
| 4.2E | 98.75 |
| AB | |
| 8.2 | 98.72 |
| 13.3 | 98.37 |
| 24.5 | 98.03 |
| 40.0 | 95.14 |
| 52.1 | 90.0 |
| 60.6 | 84.9 |
| 71.0 | 73.2 |
| 74.7 | 67.5 |
| **78.2** | **50.0** |
| 77.1 | 41.0 |
| AB + B | |
| 74.0E | 30.6 |
| B | |
| 77.6 | 26.5 |
| 83.5 | 17.9 |
| 87.3 | 10.4 |
| 92.5 | 0 |

1026. (191, 192)
B = $C_{20}H_{24}N_2O_2$
Quinine

| °C | Wt. % A |
|---|---|
| A | |
| 5.5 | 100 |
| A + AB | |
| 5.3 | 99.7 |
| B | |
| 174.7 | 0 |

*v. also* 7.1, 24, 33, 44, 87, 127, 192, 245, 257, 274, 392, 405, 423, 426, 429, 500, 506, 509, 589, 664, 669, 671, 679, 688, 693, 697, 709, 730, 755, 771, 773, 795, 796, 797, 835, 840, 841, 848, 871, 900, 924

## $C_6H_6ClN$
Chloroanilines
956, 957, 958

## $C_6H_6N_2O$
*p*-Nitrosoaniline
1027. (201, 202)
B = $C_6H_6N_2O_2$
*p*-Nitroaniline

| °C | Wt. % A |
|---|---|
| A | |
| 169.0 | 100 |
| A + B | |
| 120.0E | 41 |
| B | |
| 147.0 | 0 |

## $C_6H_6N_2O_2$
*o*-Nitroaniline
1028.
B = $C_6H_6N_2O_2$
*m*-Nitroaniline
*v.* 1862

1029.
B = $C_6H_6N_2O_2$
*p*-Nitroaniline
*v.* 1862

1029.1. (73)
B = $C_8H_{10}$
*m*-Xylene

| °C | g A per 100 g B |
|---|---|
| 15.0 | 11.6 |

1030. (101)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 69.4 | 100 |
| A + B | |
| 6.0E | 50.5 |
| B | |
| 178.0 | 0 |

*v. also* 542, 850, 954, 959, 1862

## $C_6H_6N_2O_2$
*m*-Nitroaniline
1031.
B = $C_6H_6N_2O_2$
*p*-Nitroaniline
*v.* 1862

1032. (203)
B = $C_7H_5N_5O_8$
Trinitrophenylmethylnitroamine (Tetryl)

| °C | Wt. % A |
|---|---|
| A | |
| 113.0 | 100 |
| A + AB | |
| 83.0E | 58 |

1032.—(*Continued*)

| °C | Wt. % A |
|---|---|
| AB | |
| **85.0** | **32** |
| AB + B | |
| 84.0E | 27 |
| B | |
| 127.5 | 0 |

1033. *v.* p. 178
B = $C_8H_9NO$
Acetanilide

1033.1. (73)
B = $C_8H_{10}$
*m*-Xylene

| °C | g A per 100 g B |
|---|---|
| 15.0 | 1.74 |

1034. (393, 394)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % A |
|---|---|
| A | |
| 110.0 | 100 |
| A + B | |
| 68.0E | 24 |
| B | |
| 80.0 | 0 |

1035. (101)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 114.0 | 100 |
| A + B | |
| 51.0E | 31.4 |
| B | |
| 178.0 | 0 |

*v. also* 543, 557, 732, 851, 960, 1028, 1862

## $C_6H_6N_2O_2$
*p*-Nitroaniline
1036. (203)
B = $C_7H_5N_5O_8$
Trinitrophenylmethylnitroamine (Tetryl)

| °C | Wt. % A |
|---|---|
| A | |
| 147.5 | 100 |
| A + AB | |
| 89.0E | 60 |
| AB | |
| **100.0** | **32** |
| AB + B | |
| 97.0E | 28 |
| B | |
| 127.5 | 0 |

1036.1. (73)
B = $C_8H_{10}$
*m*-Xylene

| °C | g A per 100 g B |
|---|---|
| 15.0 | 0.28 |

1037. (100)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 147.4 | 100 |
| A + B | |
| 76.0E | 31 |
| B | |
| 178.0 | 0 |

*v. also* 558, 852, 955, 961, 1027, 1029, 1031, 1862

## $C_6H_6O$
Phenol
1041. (418, 470)
B = $C_6H_7N$
Aniline

| °C | Mol % A |
|---|---|
| A | |
| 40.5 | 100 |
| 36.7 | 95 |
| 31.5 | 90 |
| A + AB | |
| 14.8E | 78.8 |
| AB | |
| 22.3 | 70 |
| 28.6 | 60 |
| **30.6** | **50** |
| 29.9 | 55 |
| 29.7 | 45 |
| 28.5 | 40 |
| 22.0 | 30 |
| +10.1 | 20 |
| − 6.5 | 10 |
| AB + B | |
| −11.7E | 7.7 |
| B | |
| − 9.7 | 5 |
| − 6.1 | 0 |

1042. (247)
B = $C_6H_7NO$
*m*-Aminophenol

| °C | Wt. % A |
|---|---|
| A | |
| 40.5 | 100 |
| A + AB | |
| 15.0E | 69 |
| AB | |
| **76.0** | **46** |
| AB + B | |
| 75.0E | 44 |
| B | |
| 118.0 | 0 |

1043. (247)
B = $C_6H_7NO$
*p*-Aminophenol

| °C | Wt. % A |
|---|---|
| A | |
| 40.5 | 100 |
| A + B | |
| 31.0E | 87 |
| 126.0d | 58.5 |

1044. (85)
B = $C_6H_8N_2$
Phenylhydrazine

| °C | Mol % A |
|---|---|
| A | |
| 40.5 | 100 |
| A + AB | |
| 18.0E | 79.5 |
| AB | |
| **42.0** | **50** |
| 36.55 | 38.42 |

1045. (257)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| °C | Wt. % A |
|---|---|
| A | |
| 40.5 | 100 |
| 32.2 | 90 |
| A + $A_4B$ | |
| 28.0E | 86 |
| $A_4B$ | |
| **29** | **80** |
| $A_4B$ + AB | |
| 28.8E | 77.5 |
| AB | |
| 34.2 | 70 |
| 41.0 | 60 |
| AB + B | |
| 43.5U | 53 |
| B | |
| 65.5 | 40 |
| 76.5 | 30 |
| 85.8 | 20 |
| 93.8 | 10 |
| 101.0 | 0 |

1046. (257)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| A | |
|---|---|
| 40.5 | 100 |
| 30.7 | 90 |
| A + $A_2B_2$ | |
| 24.0E | 85 |
| $A_2B_2$ | |
| 34.3 | 80 |
| 47.3 | 70 |
| **52.6** | **56.6** |
| 51.8 | 50 |
| 48.8 | 40 |
| 44.5 | 30 |
| $A_2B_2$ + B | |
| 41.0E | 23 |
| B | |
| 54.0 | 10 |
| 62.0 | 0 |

1047. (257)
B = $C_6H_8N_2$
*p*-Phenylenediamine

| A | |
|---|---|
| 40.5 | 100 |
| A + $A_2B$ | |
| 40.0E | 98.5 |
| $A_2B$ | |
| 56.0 | 95 |
| 76.5 | 90 |

1047.—(*Continued*)

| °C | Wt. % A |
|---|---|
| $A_2B$ | |
| 96.5 | 80 |
| 103.9 | 70 |
| **104.9** | **63.5** |
| 99.6 | 50 |
| $A_2B$ + B | |
| 94.0E | 42 |
| B | |
| 111.7 | 30 |
| 122.8 | 20 |
| 131.7 | 10 |
| 140.0 | 0 |

1048. (292)
B = $C_6H_{10}O$
Cyclohexanone

| A | |
|---|---|
| 42.0 | 100 |
| 30.8 | 90 |
| +16.0 | 80 |
| −11.5 | 70 |
| A + AB | |
| −36.0E | 63.5 |
| AB | |
| **−22.5** | **53** |
| −26.0 | 40 |
| −38.5 | 30 |
| −62.5 | 20 |

1049. (292)
B = $C_7H_6NO_3$
*m*-Nitrobenzaldehyde

| °C | Mol % A |
|---|---|
| A | |
| +41.0 | 100 |
| A + B | |
| −14.0E | 59.8 |
| B | |
| +55.5 | 0 |

1050. *v.* p. 178
B = $C_7H_6O_2$
*m*-Hydroxybenzaldehyde

1051. (292)
B = $C_7H_6O_2$
*p*-Hydroxybenzaldehyde

| °C | Wt. % A |
|---|---|
| A | |
| 41.0 | 100 |
| 34.8 | 90 |
| 27.2 | 80 |
| A + B | |
| 20.0E | 72 |
| B | |
| 49.5 | 60 |
| 67.0 | 50 |
| 79.2 | 40 |
| 90.0 | 30 |
| 99.5 | 20 |
| 108.0 | 10 |
| 115.0 | 0 |

**$C_6H_6O$.—**
*(Continued)*

1052. (375)
B = $C_7H_7Br$
*p*-Bromotoluene

| °C | Wt. % A |
|---|---|
| A | |
| 40.06 | 100 |
| 37.7 | 95 |
| 35.5 | 90 |
| 31.5 | 80 |
| 27.6 | 70 |
| 23.5 | 60 |
| 18.9 | 50 |
| A + B | |
| 13.5E | 40.3 |
| B | |
| 16.65 | 30 |
| 19.4 | 20 |
| 22.0 | 10 |
| 23.75 | 5 |
| 26.74 | 0 |

1053. (267)
B = $C_7H_7NO$
Benzamide

| | |
|---|---|
| A | |
| 40.8 | 100 |
| A + $A_2B$ | |
| 15.0E | 74 |
| $A_2B$ + B | |
| 22.5U | 64 |
| B | |
| 124.0 | 0 |

1054. (90, 118, 454)
B = $C_7H_8O$
*o*-Cresol
Mix.

| | |
|---|---|
| 40.5 | 100 |
| 37.9 | 95 |
| 35.2 | 90 |
| 29.5 | 80 |
| 23.4 | 70 |
| 19.9 | 60 |
| 19.85† | 55 |
| 19.9 | 50 |
| 20.9 | 40 |
| 22.6 | 30 |
| 24.95 | 20 |
| 27.6 | 10 |
| 29.0 | 5 |
| 30.45 | 0 |

1055. (90, 118, 454)
B = $C_7H_8O$
*m*-Cresol

| | |
|---|---|
| A | |
| 40.5 | 100 |
| 38.3 | 95 |
| 36.2 | 90 |
| 31.7 | 80 |
| 27.3 | 70 |
| 22.8 | 60 |
| A + $AB_2$ | |
| 20.2E | 55.2 |

1055.—*(Continued)*

| °C | Wt. % A |
|---|---|
| $AB_2$ | |
| 22.0 | 50 |
| 24.8 | 40 |
| **25.9** | **30.4** |
| 24.0 | 20 |
| 17.0 | 10 |
| $AB_2$ + B | |
| 7.3E | 4.8 |
| B | |
| 10.0 | 0 |

*v. also* 1863

1056. (90, 118, 454)
B = $C_7H_8O$
*p*-Cresol

| | |
|---|---|
| A | |
| 40.5 | 100 |
| 37.2 | 95 |
| 33.9 | 90 |
| 26.9 | 80 |
| 18.9 | 70 |
| +9.0 | 60 |
| A + $AB_2$ | |
| −1.5E | 50.5 |
| $AB_2$ + B | |
| +0.8U | 41.3 |
| B | |
| 11.6 | 30 |
| 19.6 | 20 |
| 27.0 | 10 |
| 30.6 | 5 |
| 34.2 | 0 |

*v. also* 1863

1057. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| °C | Mol % A |
|---|---|
| A | |
| 42.4 | 100 |
| 37.2 | 95 |
| 27.9 | 90 |
| A + $A_2B$ | |
| 7.0E | 83.5 |
| $A_2B$ | |
| 19.5 | 80 |
| 30.0 | 75 |
| 35.5 | 70 |
| **36.8** | **66.7** |
| 32.5 | 60 |
| $A_2B$ + B | |
| 27.0E | 55.5 |
| B | |
| 54.6 | 50 |
| 74.0 | 45 |
| 87.0 | 40 |
| 97.5 | 35 |
| 106.0 | 30 |
| 112.8 | 25 |
| 118.6 | 20 |
| 123.0 | 15 |
| 126.6 | 10 |
| 132.1 | 0 |

1058. (223)
B = $C_7H_9N$
*o*-Toluidine

| °C | Mol % A |
|---|---|
| A | |
| 41.0 | 100 |
| 36.7 | 95 |
| 30.0 | 90 |
| A + AB | |
| 12.0E | 82 |
| AB | |
| 27.0 | 70 |
| 32.8 | 60 |
| 33.8 | 55 |
| **34.0** | **50** |
| 33.8 | 45 |
| 32.8 | 40 |
| 27.3 | 30 |
| +14.0 | 20 |
| −15.0 | 9 |

1059. (223)
B = $C_7H_9N$
*p*-Toluidine

| | |
|---|---|
| A | |
| 41.0 | 100 |
| 37.7 | 95 |
| 33.0 | 90 |
| 19.2 | 80 |
| A + AB | |
| 11.0E | 75 |
| AB | |
| 18.5 | 70 |
| 27.1 | 60 |
| 28.7 | 55 |
| **29.0** | **50** |
| 28.4 | 45 |
| 26.0 | 40 |
| AB + B | |
| 18.5E | 32 |
| B | |
| 31.0 | 20 |
| 38.4 | 10 |
| 40.6 | 5 |
| 42.5 | 0 |

1060. (249)
B = $C_8H_8O$
Acetophenone

| °C | Wt. % A |
|---|---|
| A | |
| +41.0 | 100 |
| A + B | |
| −52.0E | 53 |
| B | |
| +20.5 | 0 |

1061. (345)
B = $C_8H_9NO$
Acetanilide

| °C | Mol % A |
|---|---|
| A | |
| 40.5 | 100 |
| 37.5 | 95 |
| 33.0 | 90 |
| +19.5 | 80 |
| A + B | |
| − 6.0E | 69 |

1061.—*(Continued)*

| °C | Mol % A |
|---|---|
| B | |
| +31.0 | 60 |
| 47.0 | 55 |
| 59.0 | 50 |
| 69.5 | 45 |
| 78.2 | 40 |
| 91.0 | 30 |
| 100.0 | 20 |
| 107.5 | 10 |
| 111.0 | 5 |
| 113.5 | 0 |

1062. (375, 377)
B = $C_8H_{10}$
*p*-Xylene

| °C | Wt. % A |
|---|---|
| A | |
| 40.24 | 100 |
| 37.4 | 95 |
| 34.6 | 90 |
| 28.9 | 80 |
| 23.3 | 70 |
| 18.1 | 60 |
| 12.8 | 50 |
| 7.6 | 40 |
| A + B | |
| 5.6E | 36 |
| B | |
| 6.45 | 30 |
| 8.15 | 20 |
| 10.3 | 10 |
| 11.7 | 5 |
| 13.35 | 0 |

1063. (220)
B = $C_8H_{10}N_2O$
Nitrosodimethyl-aniline

| °C | Mol % A |
|---|---|
| A | |
| 41.5 | 100 |
| 36.8 | 95 |
| 30.0 | 90 |
| A + $AB_2$ | |
| 12.5E | 80 |
| $AB_2$ | |
| 59.5 | 70 |
| 79.0 | 60 |
| 87.0 | 50 |
| 89.1 | 45 |
| 90.7 | 40 |
| **91.5** | **33** |
| 90.5 | 30 |
| 88.2 | 25 |
| 84.7 | 20 |
| 79.8 | 15 |
| $AB_2$ + B | |
| 75.5E | 12 |
| B | |
| 82.4 | 5 |
| 86.0 | 0 |

1064. (53, 223)
B = $C_8H_{11}N$
Dimethylaniline

1064.—*(Continued)*

| °C | Mol % A |
|---|---|
| A | |
| 40.5 | 100 |
| 36.2 | 95 |
| 31.3 | 90 |
| 18.3 | 80 |
| + 0.5 | 70 |
| −22.8 | 60 |
| A + B | |
| −36.0E | 54.8 |
| B | |
| −30.8 | 50 |
| −26.0 | 45 |
| −21.5 | 40 |
| −13.5 | 30 |
| − 7.3 | 20 |
| − 2.1 | 10 |
| + 0.2 | 5 |
| 2.0 | 0 |

1065. (223)
B = $C_8H_{11}N$
*m*-Xylidine

| | |
|---|---|
| A | |
| 41.0 | 100 |
| 37.6 | 95 |
| 32.7 | 90 |
| +17.2 | 80 |
| A + AB | |
| − 1.0E | 71 |
| AB | |
| +12.7 | 60 |
| 15.3 | 55 |
| **16.0** | **50** |
| 15.3 | 45 |
| 13.2 | 40 |
| + 4.7 | 30 |
| − 9.0 | 20 |

1066. (53)
B = $C_9H_7N$
Quinoline

| | |
|---|---|
| A | |
| +41.0 | 100 |
| A + $A_2B$ | |
| − 0.7E | 77.6 |
| $A_2B$ | |
| **+ 7.2** | **66.7** |
| $A_2B$ + $A_2B_2$ | |
| − 4.6E | 57.5 |
| $A_2B_2$ | |
| **+22.4** | **40** |
| $A_2B_2$ + B | |
| −24.1E | 5 |
| B | |
| −19.5 | 0 |

1066.1. (274.1)
B = $C_9H_8O_2$
Cinnamic acid

| °C | Wt. % A |
|---|---|
| A | |
| 40.5 | 100 |
| A + B | |
| 29.0E | 85 |
| B | |
| 133.0 | 0 |

1067. (151, 345, 483)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % A |
|---|---|
| A | |
| 40.5 | 100 |
| 33.4 | 90 |
| A + B | |
| 29.8E | 84 |
| B | |
| 46.7 | 70 |
| 53.7 | 60 |
| 58.8 | 50 |
| 63.4 | 40 |
| 67.3 | 30 |
| 71.3 | 20 |
| 75.3 | 10 |
| 80.1 | 0 |

1068. (381)
B = $C_{10}H_9N$
α-Naphthylamine

| | |
|---|---|
| A | |
| 40.5 | 100 |
| 36.7 | 95 |
| 31.5 | 90 |
| A + AB | |
| 16.0E | 77 |
| AB | |
| 21.3 | 70 |
| 26.9 | 60 |
| 28.2 | 55 |
| **28.6** | **50** |
| 28.2 | 45 |
| 28.0 | 40 |
| AB + B | |
| 24.0E | 32 |
| B | |
| 34.3 | 20 |
| 42.0 | 10 |
| 45.4 | 5 |
| 48.3 | 0 |

1069. (223)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| A | |
| 40.5 | 100 |
| A + AB | |
| 36.0E | 96 |
| AB | |
| 54.5 | 90 |
| 71.7 | 80 |
| 78.8 | 70 |
| 82.6 | 60 |
| 83.3 | 55 |
| **83.5** | **50** |
| AB + B | |
| 83.0E | 42.5 |
| B | |
| 84.7 | 40 |
| 91.5 | 30 |
| 98.0 | 20 |
| 104.0 | 10 |
| 106.7 | 5 |
| 109.0 | 0 |

1070. (375)
B = $C_{10}H_{14}O$
Thymol

| °C | Wt. % A |
|---|---|
| A | |
| 39.53 | 100.00 |
| 36.20 | 93.31 |
| 31.58 | 84.52 |
| 25.82 | 75.28 |
| 12.90 | 58.49 |
| 9.08 | 53.59 |
| A + B | |
| 7.49E | 51.83 |
| B | |
| 8.29 | 49.69 |
| 19.17 | 39.45 |
| 25.09 | 30.83 |
| 33.64 | 20.54 |
| 40.52 | 10.65 |
| 49.24 | 0.00 |

1071. (268, 481)
B = $C_{10}H_{16}O$
Camphor

| | |
|---|---|
| A | |
| 40.5 | 100 |
| 37.0 | 95 |
| 33.2 | 90 |
| 25.0 | 80 |
| +11.0 | 70 |
| −15.0 | 60 |
| A + AB | |
| −30.0E | 56 |
| AB | |
| −24.5 | 50 |
| **−18.6** | **36** |
| AB + B | |
| −22.0E | 29 |
| B | |
| +15.0 | 25 |
| 58.0 | 20 |
| 94.0 | 15 |
| 128.0 | 10 |
| 156.0 | 5 |
| 178.0 | 0 |

1072. (234)
B = $C_{10}H_{16}O$
Fenchone

| | |
|---|---|
| A | |
| 41.0 | 100 |
| No solid phase | |
| −2.0 to −14.0 | 90.8 to 43.8 |
| B | |
| 5.3 | 0 |

1073. (36)
B = $C_{10}H_{18}O$
Cineole

| | |
|---|---|
| A | |
| +42.5 | 100 |
| A + AB | |
| −13.0E | 55 |
| AB | |
| **− 8.0** | **38** |
| AB + B | |
| −14.0E | 17 |

1073.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| + 1.0 | 0 |

1074. (238)
B = $C_{11}H_{12}N_2O$
Antipyrine

| | |
|---|---|
| A | |
| 41.0 | 100 |
| No solid phase | |
| 11 to 16.5 | 76.2 to 54 |
| AB | |
| **55.5** | **33** |
| AB + B | |
| 52.5E | 27 |
| B | |
| 109.8 | 0 |

1075. (381)
B = $C_{12}H_{11}N$
Diphenylamine

| °C | Mol % A |
|---|---|
| A | |
| 36.8 | 95.5 |
| 30.3 | 86.9 |
| 24.6 | 78 |
| 19.8 | 70.7 |
| A + B | |
| 18.1E | 69 |
| B | |
| 25.0 | 57.2 |
| 32.0 | 44.3 |
| 37.1 | 34.1 |
| 44.1 | 18.4 |
| 48.2 | 9.3 |
| 52.6 | 0.0 |

1076. (413)
B = $C_{12}H_{18}O_8$
Diethyl diacetyl-tartrate

| | |
|---|---|
| A | |
| 40 | 100 |
| 33.9 | 94.61 |
| 24.6 | 89.04 |
| 18.6 | 85.95 |
| +11.1 | 82.60 |
| − 3.6 | 76.98 |
| A + B | |
| −24.15E | 71.20 |
| B | |
| − 4.6 | 66.31 |
| +17.25 | 58.37 |
| 31.9 | 48.64 |
| 46.2 | 35.48 |
| 51.0 | 27.82 |
| 55.7 | 19.70 |
| 58.6 | 14.26 |
| 62.7 | 6.12 |
| 67.0 | 0 |

1077. (262)
B = $C_{13}H_9N$
Acridine

| °C | Wt. % A |
|---|---|
| A | |
| 40.5 | 100 |

1077.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A + $A_2B$ | |
| 36.0E | 93.5 |
| $A_2B$ | |
| 42.0 | 90 |
| 60.0 | 80 |
| 74.0 | 70 |
| 83.5 | 60 |
| **87.0** | **51** |
| $A_2B$ + $A_2B_3$ | |
| 83.0E | 45 |
| $A_2B_3$ | |
| 90.0 | 40 |
| **101.0** | **26** |
| 98.0 | 20 |
| $A_2B_3$ + B | |
| 87.5E | 13 |
| B | |
| 92.0 | 10 |
| 99.0 | 5 |
| 106.5 | 0 |

1078. (274)
B = $C_{13}H_{10}O$
Benzophenone

| | |
|---|---|
| A | |
| +40.8 | 100 |
| A + AB | |
| −13.0E | 52 |
| AB | |
| **− 3.0** | **34** |
| AB + B | |
| − 4.5E | 30 |
| B | |
| +47.0 | 0 |

1079. (375)
B = $C_{13}H_{12}$
Diphenylmethane

| | |
|---|---|
| A | |
| 40.24 | 100.00 |
| 16.73 | 51.08 |
| 12.94 | 43.43 |
| A + B | |
| 11.52E | 36.68 |
| B | |
| 13.24 | 31.56 |
| 16.49 | 20.73 |
| 18.40 | 14.24 |
| 20.72 | 8.08 |
| 24.45 | 0.00 |

1080. (234.1, 292)
B = $C_{13}H_{12}O$
Benzhydrol

| | |
|---|---|
| A | |
| 41.5 | 100 |
| A + $A_2B$ | |
| 30E | 81 |
| $A_2B$ | |
| **47.3** | **50.5** |
| $A_2B$ + B | |
| 37E | 27 |
| B | |
| 64.5 | 0 |

1081. (53)
B = $C_{13}H_{13}N$
Diphenyl-methylamine

| °C | Mol % A |
|---|---|
| A | |
| +41.0 | 100 |
| A + B | |
| −18.1E | 25 |
| B | |
| − 9.6 | 0 |

1082. (254)
B = $C_{19}H_{16}$
Triphenylmethane

| °C | Wt. % A |
|---|---|
| A | |
| 41.0 | 100 |
| A + B | |
| 31.0E | 74 |
| B | |
| 91.0 | 0 |

1083. (271)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| A | |
| 41.0 | 100 |
| A + B | |
| 32.0E | 78 |
| B | |
| 159.3 | 0 |

*v. also* 76, 128, 193, 220, 246, 275, 298, 313, 323.1, 374, 393, 401, 402, 444, 458.5, 459.5, 480, 510, 591, 853, 962, 1852, 1860, 1863

$C_6H_6O_2$
Catechol

1084. (195, 420)
B = $C_6H_6O_2$
Resorcinol

| °C | Mol % A |
|---|---|
| A | |
| 103.5 | 100.0 |
| 100.0 | 94.2 |
| 90.0 | 78.5 |
| 80.0 | 64.5 |
| 70.0 | 53.2 |
| A + B | |
| 64.0E | 47.0 |
| B | |
| 70.0 | 42.7 |
| 80.0 | 35.2 |
| 90.0 | 26.7 |
| 100.0 | 15.8 |
| 109.5 | 0.0 |

*v. also* 1864, 1865

1085. (195, 420)
B = $C_6H_6O_2$
Hydroquinol

| | |
|---|---|
| A | |
| 103.5 | 100.0 |
| 100.0 | 94.4 |
| 90.0 | 79.4 |

1085.—(*Continued*)

| °C | Mol % A |
|---|---|
| A + B | |
| 88.5E | 77.0 |
| B | |
| 100.0 | 73.0 |
| 110.0 | 68.2 |
| 120.0 | 63.3 |
| 130.0 | 57.0 |
| 140.0 | 49.0 |
| 150.0 | 36.4 |
| 160.0 | 10.7 |
| 170.5 | 0.0 |

*v. also* 1864, 1866

1086. (259)
B = $C_6H_7N$
Aniline

| | |
|---|---|
| A | |
| 105.0 | 100.0 |
| 100.0 | 91.6 |
| 91.5 | 79.5 |
| 82.5 | 70.6 |
| 68.0 | 59.1 |
| 56.0 | 53.3 |
| A + AB | |
| 39.0U | 46.5 |
| AB | |
| 37.0 | 40.9 |
| 26.0 | 29.9 |
| + 4.8 | 20.5 |
| AB + B | |
| −14.0 | 11.5 |
| − 9.0 | 5.0 |
| − 6.3 | 0.0 |

1087. (247)
B = $C_6H_7NO$
*m*-Aminophenol

| °C | Wt. % A |
|---|---|
| A | |
| 101.5 | 100 |
| A + B | |
| 66.0E | 54 |
| B | |
| 118.0 | 0 |

1088. (264)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| | |
|---|---|
| A | |
| 102.7 | 100 |
| A + AB | |
| 76.0E | 72 |
| AB | |
| **84.5** | **50** |
| AB + B | |
| 76.0E | 30 |
| B | |
| 98.8 | 0 |

1089. (264)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| | |
|---|---|
| A | |
| 88.5E | 77.0 |
| B | |
| 100.0 | 73.0 |
| 110.0 | 68.2 |
| 120.0 | 63.3 |
| 130.0 | 57.0 |
| 140.0 | 49.0 |
| 150.0 | 36.4 |
| 160.0 | 10.7 |
| 170.5 | 0.0 |

*v. also* 1864, 1866

1086. (259)
B = $C_6H_7N$
Aniline

| | |
|---|---|
| A | |
| 105.0 | 100.0 |
| 100.0 | 91.6 |
| 91.5 | 79.5 |
| 82.5 | 70.6 |
| 68.0 | 59.1 |
| 56.0 | 53.3 |
| A + AB | |
| 39.0U | 46.5 |
| AB | |
| 37.0 | 40.9 |
| 26.0 | 29.9 |
| + 4.8 | 20.5 |
| AB + B | |
| −14.0 | 11.5 |
| − 9.0 | 5.0 |
| − 6.3 | 0.0 |

1087. (247)
B = $C_6H_7NO$
*m*-Aminophenol

| °C | Wt. % A |
|---|---|
| A | |
| 101.5 | 100 |
| A + B | |
| 66.0E | 54 |
| B | |
| 118.0 | 0 |

1088. (264)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| | |
|---|---|
| A | |
| 102.7 | 100 |
| A + AB | |
| 76.0E | 72 |
| AB | |
| **84.5** | **50** |
| AB + B | |
| 76.0E | 30 |
| B | |
| 98.8 | 0 |

1089. (264)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| | |
|---|---|
| A | |
| 56.0E | 57 |

1089.—(*Continued*)

| °C | Wt. % A |
|---|---|
| AB | |
| **64.5** | **50** |
| AB + B | |
| 41.0E | 16 |
| B | |
| 62.0 | 0 |

1090. (264)
B = $C_6H_8N_2$
*p*-Phenylenediamine

| | |
|---|---|
| A | |
| 102.8 | 100 |
| A + $A_2B_2$ | |
| 87.5E | 85 |
| $A_2B_2$ | |
| **108.0** | **60.4** |
| $A_2B_2$ + B | |
| 99.0E | 35 |
| B | |
| 138.0 | 0 |

1091. *v.* p. 178
B = $C_7H_6O_2$
*m*-Hydroxybenz-aldehyde

1092. (231)
B = $C_7H_7NO$
Benzamide

| | |
|---|---|
| A | |
| 102.8 | 100 |
| A + B | |
| 38.0E | 50.5 |
| B | |
| 124.0 | 0 |

1093. (383)
B = $C_7H_9N$
*p*-Toluidine

| °C | Mol % A |
|---|---|
| A | |
| 103.2 | 100 |
| A + AB | |
| 49.8E | 54 |
| AB | |
| **50.2** | **50** |
| AB + $AB_2$ | |
| 41.4E | 34.5 |
| $AB_2$ | |
| **41.4** | **33** |
| $AB_2$ + B | |
| 32.6E | 16.4 |
| B | |
| 43.4 | 0 |

1094. (249)
B = $C_8H_8O$
Acetophenone

| °C | Wt. % A |
|---|---|
| A | |
| 102.0 | 100 |
| A + AB | |
| + 1.0U | 41 |
| AB + B | |
| − 2.0E | 28 |
| B | |
| +20.5 | 0 |

$C_5H_6O_2$.—(*Continued*)

1094.1. (274.1)
B = $C_9H_8O_2$
Cinnamic acid

| °C | Wt. % A |
|---|---|
| A | |
| 103.5 | 100 |
| A + B | |
| 81.0E | 54 |
| B | |
| 133.0 | 0 |

1095. (420)
B = $C_{10}H_7NO_2$
α-Nitronaphthalene

| | |
|---|---|
| A | |
| 103.5 | 100 |
| 101.2 | 95 |
| 99.1 | 90 |
| 95.2 | 80 |
| 91.1 | 70 |
| 86.5 | 60 |
| 81.0 | 50 |
| 73.3 | 40 |
| 63.0 | 30 |
| A + B | |
| 44.8E | 17 |
| B | |
| 49.7 | 10 |
| 52.9 | 5 |
| 55.8 | 0 |

*v. also* 1865, 1866

1096. (245)
B = $C_{10}H_8$
Naphthalene

| | |
|---|---|
| A | |
| 104.0 | 100 |
| 101.0 | 95 |
| 98.3 | 90 |
| 93.7 | 80 |
| 89.7 | 70 |
| 86.2 | 60 |
| 84.0 | 50 |
| 82.7 | 40 |
| 80.0 | 30 |
| A + B | |
| 72.0E | 18 |
| B | |
| 75.5 | 10 |
| 77.7 | 5 |
| 80.1 | 0 |

1097. (383)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Mol % A |
|---|---|
| A | |
| 103.2 | 100 |
| 94.0 | 84.6 |
| 83.0 | 71.3 |
| 71.3 | 60.4 |
| 56.3 | 50.0 |
| $A + AB_2$ | |
| 41.65E | 42.0 |

1097.—(*Continued*)

| °C | Mol % A |
|---|---|
| $AB_2$ | |
| 42.05 | 39.1 |
| **43.4** | **33** |
| 40.95 | 23.7 |
| $AB_2$ + B | |
| 36.95E | 16 |
| B | |
| 38.4 | 13.9 |
| 41.3 | 10.2 |
| 48.0 | 0 |

1098. (232)
B = $C_{10}H_9N$
β-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 103.0 | 100 |
| A + B | |
| 75.0E | 57 |
| AB | |
| **77.4** | **43** |
| AB + B | |
| 76.3E | 35 |
| B | |
| 109.0 | 0 |

1099. (97, 98, 253)
B = $C_{10}H_{16}O$
Camphor

| | |
|---|---|
| A | |
| 102.5 | 100 |
| $A + AB_2$ | |
| 0E | 38.7 |
| $AB_2$ + B | |
| **8U** | **27** |
| B | |
| 175.0 | 0 |

1100. (234)
B = $C_{10}H_{16}O$
Fenchone

| | |
|---|---|
| A | |
| 103.5 | 100 |
| No solid phase | |
| −5.0 to −3.0 | 40.5 to 8.0 |
| B | |
| 5.3 | 0 |

1101. (36)
B = $C_{10}H_{18}O$
Cineole

| | |
|---|---|
| A | |
| 104.0 | 100 |
| A + AB | |
| 31.0E | 44 |
| AB | |
| **+39.0** | **41.6** |
| AB + B | |
| − 2.0E | 5 |
| B | |
| + 1.0 | 0 |

1102. (238)
B = $C_{11}H_{12}N_2O$
Antipyrine

| | |
|---|---|
| A | |
| 103.0 | 100 |

1102.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A + $A_2B$ | |
| 57.5E | 68.5 |
| $A_2B$ | |
| **73.6** | **54** |
| $A_2B$ + AB | |
| 57.0E | 42 |
| AB | |
| **58.8** | **37** |
| AB + $AB_2$ | |
| 57.0E | 30 |
| $AB_2$ | |
| **65.5** | **22.6** |
| $AB_2$ + B | |
| 65.2E | 22 |
| B | |
| 109.8 | 0 |

1103. *v.* p. 178
B = $C_{12}H_9N$
Carbazole

1103.1. (274.2)
B = $C_{12}H_{10}N_2$
Azobenzene

| °C | Wt. % A |
|---|---|
| A | |
| 104.5 | 100 |
| A + B | |
| 60.0E | 12.5 |
| B | |
| 67 | 0 |

1104. (261)
B = $C_{12}H_{11}N$
Diphenylamine

| °C | Wt. % A |
|---|---|
| A | |
| 102.8 | 100 |
| A + B | |
| 48.5E | 6.5 |
| B | |
| 52.3 | 0 |

1105. (262)
B = $C_{13}H_9N$
Acridine

| | |
|---|---|
| A | |
| 102.8 | 100 |
| 97.0 | 90 |
| A + AB | |
| 93.5E | 85 |
| AB | |
| 101.0 | 80 |
| 114.0 | 70 |
| 125.0 | 60 |
| 135.0 | 50 |
| **144.5** | **38** |
| 143.0 | 30 |
| 134.5 | 20 |
| 122.0 | 10 |
| AB + B | |
| 102.0E | 4 |
| B | |
| 106.5 | 0 |

1106. (274)
B = $C_{13}H_{10}O$
Benzophenone

| °C | Wt. % A |
|---|---|
| A | |
| 103.0 | 100 |
| A + B | |
| 11.3E | 29 |
| B | |
| 47.0 | 0 |

1107. (235)
B = $C_{13}H_{12}$
Diphenylmethane

| | |
|---|---|
| A | |
| 101.8 | 100 |
| A + B | |
| 23.1E | 1 |
| B | |
| 23.9 | 0 |

1107.1. (234.1)
B = $C_{13}H_{12}O$
Benzhydrol

| | |
|---|---|
| A | |
| 103.5 | 100 |
| A + B | |
| 55.0E | 18 |
| B | |
| 64.5 | 0 |

1108. (254)
B = $C_{19}H_{16}$
Triphenylmethane

| | |
|---|---|
| A | |
| 102.8 | 100 |
| A + B | |
| 80.0E | 18 |
| B | |
| 91.0 | 0 |

1109. (271)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| A | |
| 103.0 | 100 |
| A + $A_2B$ | |
| 76.0E | 60.5 |
| $A_2B$ | |
| **82.0** | **45.8** |
| $A_2B$ + B | |
| 66.0E | 33.5 |
| B | |
| 159.2 | 0 |

*v. also* 299, 375, 445, 458.6, 459.6, 481, 592, 1860, 1864, 1866

$C_6H_6O_2$
Resorcinol

1110. (195, 420)
B = $C_6H_6O_2$
Hydroquinol

| °C | Mol % A |
|---|---|
| A | |
| 109.5 | 100.0 |
| 100.0 | 84.2 |

1110.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 90.0 | 73.3 |
| A + B | |
| 86.0E | 70.0 |
| B | |
| 90.0 | 69.2 |
| 100.0 | 66.7 |
| 110.0 | 63.5 |
| 120.0 | 59.3 |
| 130.0 | 54.5 |
| 140.0 | 47.3 |
| 150.0 | 36.3 |
| 160.0 | 19.7 |
| 170.5 | 0.0 |

*v. also* 1864

1111. (259)
B = $C_6H_7N$
Aniline

| | |
|---|---|
| A | |
| 110.0 | 100.0 |
| 102.0 | 89.6 |
| 89.5 | 73.8 |
| 77.5 | 64.7 |
| 65.0 | 56.8 |
| 50.0 | 50.3 |

1112. (247)
B = $C_6H_7NO$
*m*-Aminophenol

| °C | Wt. % A |
|---|---|
| A | |
| 108.5 | 100 |
| A + B | |
| 62.0E | 55 |
| B | |
| 118.0 | 0 |

1113. (247)
B = $C_6H_7NO$
*p*-Aminophenol

| | |
|---|---|
| A | |
| 108.5 | 100 |
| A + B | |
| 61.0E | 75 |
| B | |
| 120.0 | 48.8 |

1114. (264)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| | |
|---|---|
| A | |
| 108.5 | 100 |
| A + AB | |
| 47.0E | 60 |
| AB | |
| **50.1** | **49.5** |
| AB + B | |
| 45.0E | 36 |
| B | |
| 100.0 | 0 |

1115. (264)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| | |
|---|---|
| A | |
| 108.5 | 100 |

1115.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A + AB | |
| 53.0E | 72 |
| AB | |
| **79.0** | **49.5** |
| AB + B | |
| 33.0E | 20 |
| B | |
| 62.0 | 0 |

1116. (264)
B = $C_6H_8N_2$
*p*-Phenylenediamine

| | |
|---|---|
| A | |
| 108.5 | 100 |
| A + AB | |
| 94.0E | 85 |
| AB | |
| **116.0** | **49.5** |
| AB + B | |
| 102.0 | 32.5 |
| B | |
| 138.0 | 0 |

1117. *v.* p. 178
B = $C_7H_6O_2$
*m*-Hydroxybenzaldehyde

1118. (231)
B = $C_7H_7NO$
Benzamide

| | |
|---|---|
| A | |
| 108.5 | 100 |
| A + AB | |
| 76.2E | 67.5 |
| AB | |
| **88.2** | **47.6** |
| AB + B | |
| 80.5E | 34 |
| B | |
| 124.8 | 0 |

1119. (383, 467)
B = $C_7H_9N$
*p*-Toluidine

| °C | Mol % A |
|---|---|
| A | |
| 108.7 | 100.0 |
| 97.8 | 84.6 |
| 80.9 | 69.6 |
| 56.5 | 58.7 |
| A + AB | |
| 30.8E | 54.5 |
| AB | |
| **31.95** | **50.0** |
| 26.4 | 40.0 |
| AB + $AB_2$ | |
| 16.4U | 33.3 |
| $AB_2$ + B | |
| 15.0E | 27.5 |
| B | |
| 19.2 | 25.6 |
| 32.9 | 15.1 |
| 43.3 | 0.0 |

1120. (249)
B = $C_8H_8O$
Acetophenone

| °C | Wt. % A |
|---|---|
| A | |
| 109.0 | 100 |
| A + AB | |
| +13.0U | 47 |
| AB + B | |
| − 5.0E | 26 |
| B | |
| +20.5 | 0 |

1121. (68)
B = $C_8H_{10}$
*m*-Xylene

1121.1. (274.1)
B = $C_9H_8O_2$
Cinnamic acid

| | |
|---|---|
| A | |
| 115.0 | 100 |
| A + B | |
| 87.0E | 59.0 |
| B | |
| 133.0 | 0 |

1122. (420)
B = $C_{10}H_7NO_2$
α-Nitronaphthalene

| | |
|---|---|
| A | |
| 109.5 | 100 |
| 107.9 | 95 |
| 106.0 | 90 |
| 102.5 | 80 |
| 98.7 | 70 |
| 94.5 | 60 |
| 89.5 | 50 |
| 83.6 | 40 |
| 76.5 | 30 |
| 65.5 | 20 |
| A + B | |
| 49.5E | 10.1 |
| B | |
| 52.9 | 5 |
| 55.8 | 0 |

*v. also* 1865

1123. (245, 467)
B = $C_{10}H_8$
Naphthalene

| | |
|---|---|
| A | |
| 110.0 | 100 |
| 105.4 | 95 |
| 102.5 | 90 |
| 99.1 | 80 |
| 97.3 | 70 |
| 97.0 | 60 |
| 97.0 | 50 |
| 96.9 | 40 |
| 96.1 | 30 |
| 94.5 | 20 |
| 88.5 | 10 |
| A + B | |
| 76.0E | 4 |
| B | |
| 80.1 | 0 |

1124. (467)
B = $C_{10}H_8O$
β-Naphthol

| °C | Mol % A |
|---|---|
| A | |
| 110 | 100.0 |
| 90 | 66.67 |
| B | |
| 88 | 50.0 |
| 100 | 33.33 |
| 122 | 0.00 |

1125. (383)
B = $C_{10}H_9N$
α-Naphthylamine

| | |
|---|---|
| A | |
| 108.8 | 100 |
| A + AB | |
| 65.0E | 53.5 |
| AB | |
| **65.05** | **50** |
| AB + B | |
| 38.2E | 15 |
| B | |
| 48.1 | 0 |

1126. (232, 467)
B = $C_{10}H_9N$
β-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 109.0 | 100 |
| A + AB | |
| 78.0E | 60.5 |
| AB | |
| **81.2** | **43.4** |
| AB + B | |
| 80.0 | 35.5 |
| B | |
| 109.0 | 0 |

1127. (97, 98, 268)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 110.0 | 100 |
| 105.5 | 95 |
| 101.0 | 90 |
| 96.0 | 85 |
| 91.0 | 80 |
| 85.0 | 75 |
| 77.0 | 70 |
| 66.0 | 65 |
| 52.0 | 60 |
| A + AB | |
| 24.0E | 52.2 |
| AB | |
| **29.0** | **50** |
| 25.2 | 45 |
| 17.8 | 40 |
| AB + B | |
| 1.0E | 33.3 |
| B | |
| 19.5 | 30 |
| 47.0 | 25 |
| 75.0 | 20 |
| 101.0 | 15 |

1127.—(*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| 130.0 | 10 |
| 160.0 | 5 |
| 178.0 | 0 |

1128. (234)
B = $C_{10}H_{16}O$
Fenchone

| °C | Wt. % A |
|---|---|
| A | |
| 115.0 | 100 |
| No solid phase | |
| 49 to −8.3 | 46.4 to 12 |
| B | |
| 5.3 | 0 |

1129. (36)
B = $C_{10}H_{18}O$
Cineole

| | |
|---|---|
| A | |
| 110.0 | 100 |
| A + AB | |
| 73.0E | 60 |
| AB | |
| +89.0 | 41.6 |
| AB + B | |
| − 2.0E | 1 |
| B | |
| + 1.0 | 0 |

1130. (238)
B = $C_{11}H_{12}N_2O$
Antipyrine

| | |
|---|---|
| A | |
| 109.8 | 100 |
| No solid phase | |
| 72.0 to 66.0 | 70.8 to 51.5 |
| AB | |
| **100.5** | **36.9** |
| AB + B | |
| 52.5E | 24 |
| B | |
| 110.0 | 0 |

1130.1. *v.* p. 178
B = $C_{12}H_9N$
Carbazole

1130.2. (274.2)
B = $C_{12}H_{10}N_2$
Azobenzene

| | |
|---|---|
| A | |
| 115.0 | 100 |
| A + B | |
| 57.2E | 20.0 |
| B | |
| 67 | 0 |

1131. (261)
B = $C_{12}H_{11}N$
Diphenylamine

| | |
|---|---|
| A | |
| 110.0 | 100 |
| A + B | |
| 48.5E | 6.5 |
| B | |
| 52.2 | 0 |

1133. (262)
B = $C_{13}H_9N$
Acridine

| °C | Wt. % A |
|---|---|
| A | |
| 107.8 | 100 |
| 103.0 | 90 |
| A + $AB_2$ | |
| 96.0E | 77.5 |
| $AB_2$ | |
| 115.0 | 70 |
| 136.0 | 60 |
| **179.5** | **23.5** |
| $AB_2$ + B | |
| 105.0E | 5 |
| B | |
| 106.5 | 0 |

1134. (274)
B = $C_{13}H_{10}O$
Benzophenone

| | |
|---|---|
| A | |
| +109.0 | 100 |
| A + B | |
| − 7.0E | 29.5 |
| B | |
| + 47.0 | 0 |

1135. (235)
B = $C_{13}H_{12}$
Diphenylmethane

| | |
|---|---|
| A | |
| 108.8 | 100 |
| 102 | 73 to 16 |
| A + B | |
| 23.1E | *ca.* 0 |
| B | |
| 23.9 | 0 |
| Two liquid phases | |
| 102Trp. | 73 16 |
| 110 | 62 25 |
| 112 | 60 29 |
| 115.4 crit. | 42 |

1135.1. (234.1)
B = $C_{13}H_{12}O$
Benzhydrol

| | |
|---|---|
| A | |
| 115.0 | 100 |
| A + B | |
| 44.0E | 27 |
| B | |
| 64.5 | 0 |

1136. (467)
B = $C_{14}H_{10}$
Anthracene

| °C | Mol % B |
|---|---|
| 213 | 100.0 |
| 190 | 66.67 |
| 186 | 50.00 |
| 180 | 33.30 |
| 110 | 0.00 |

1137. (254)
B = $C_{19}H_{16}$
Triphenylmethane

| °C | Wt. % A |
|---|---|
| A | |
| 109.0 | 100 |

1137.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 106.0 | 86 to 10 |
| A + B | |
| 87.0E | 6 |
| B | |
| 91.0 | 0 |
| Two liquid phases | |
| 160.0Trp. | 86 10 |
| 130 | 77 16 |
| 135 | 72.1 12 |
| 140 | 65 35 |
| 142 crit. | 45 |

1138. (271)
B = $C_{19}H_{16}O$
Triphenyl carbinol

*v. also* 300, 324, 376, 446, 458.7, 459.7, 482, 593, 854, 1084, 1860, 1864

$C_6H_6O_2$
Hydroquinol
1139. (259)
B = $C_6H_7N$

| °C | Mol % A |
|---|---|
| A | |
| 169.0 | 100 |
| A + $AB_2$ | |
| 88.5E | 33.3 |
| $AB_2$ | |
| 85.0 | 21.1 |
| 68.5 | 7.4 |
| 54.5 | 3.1 |

1140. (247)
B = $C_6H_7NO$
*m*-Aminophenol

| °C | Wt. % A |
|---|---|
| A | |
| 168.0 | 100.0 |
| A + $A_xB_y$ | |
| 107.0U | 42.0 |
| $A_xB_y$ + B | |
| 104.5E | 22.0 |
| B | |
| 118.0 | 0.0 |

1141. (264)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| | |
|---|---|
| A | |
| 169.0 | 100 |
| A + $AB_2$ | |
| 103.0E | 39.5 |
| $AB_2$ | |
| **105.0** | **33.7** |
| $AB_2$ + B | |
| 91.8E | 11 |
| B | |
| 99.8 | 0 |

1142. (264)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| | |
|---|---|
| A | |
| 169.0 | 100 |
| A + $AB_2$ | |
| 103.0E | 39.5 |
| $AB_2$ | |
| **105.0** | **33.7** |
| $AB_2$ + B | |
| 91.8E | 11 |
| B | |
| 99.8 | 0 |

1142.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A + AB | |
| 120.0E | 58 |
| AB | |
| **127.0** | **50.4** |
| AB + B | |
| 60.0E | 6 |
| B | |
| 62.0 | 0 |

1143. (264)
B = $C_6H_8N_2$
*p*-Phenylenediamine

| | |
|---|---|
| A | |
| 169.0 | 100 |
| A + $A_3B$ | |
| 152.0E | 81 |
| $A_3B$ | |
| **155.0** | **75.5** |
| $A_3B$ + AB | |
| 155.0E | 72 |
| AB | |
| **193.0** | **50.4** |
| AB + B | |
| 134.0E | 7 |
| B | |
| 138.0 | 0 |

1144. (258)
B = $C_7H_6O_2$
*m*-Hydroxybenzaldehyde

| | |
|---|---|
| A | |
| 169.0 | 100 |
| A + B | |
| 88.0E | 27 |
| B | |
| 105.0 | 0 |

1145. (231)
B = $C_7H_7NO$
Benzamide

| | |
|---|---|
| A | |
| 169.0 | 100 |
| A + $AB_2$ | |
| 100.0E | 44 |
| $AB_2$ | |
| **103.9** | **31.2** |
| $AB_2$ + B | |
| 101.1E | 23 |
| B | |
| 124.8 | 0 |

1146. (383)
B = $C_7H_9N$
*p*-Toluidine

| °C | Mol % A |
|---|---|
| A | |
| 169.2 | 100 |
| A + $AB_2$ | |
| 96.5E | 37 |
| $AB_2$ | |
| **96.75** | **33** |
| $AB_2$ + B | |
| 42.6E | 1.2 |
| B | |
| 43.4 | 0 |

**$C_6H_6O_2$.—**
*(Continued)*

1147. (249)
B = $C_8H_8O$
Acetophenone

| °C | Wt. % A |
|---|---|
| A | |
| 168.2 | 100 |
| A + AB | |
| 40.0U | 18 |
| AB + B | |
| 18.5E | 3.5 |
| B | |
| 20.5 | 0 |

1147.1. (274.1)
B = $C_9H_8O_2$
Cinnamic acid

| A | |
|---|---|
| 170.0 | 100 |
| A + B | |
| 117.0E | 19.0 |
| B | |
| 133.0 | 0 |

1148. (420)
B = $C_{10}H_7NO_2$
α-Nitro-naphthalene

| A | |
|---|---|
| 170.5 | 100 |
| 168.7 | 95 |
| 167.0 | 90 |
| 163.6 | 80 |
| 160.2 | 70 |
| 156.6 | 60 |
| 152.9 | 50 |
| 148.6 | 40 |
| 143.5 | 30 |
| 136.0 | 20 |
| 121.0 | 10 |
| A + B | |
| 54.5E | 2.5 |
| B | |
| 55.8 | 0.0 |

*v. also* 1866

1149. (245)
B = $C_{10}H_8$
Naphthalene

| A | |
|---|---|
| 170.0 | 100 |
| 163.5 | 95 |
| 159.0 | 90 |
| 156.0 | 80 |
| 155.5 | 70 |
| 154.8 | 60 |
| 154.2 | 50 |
| 153.7 | 40 |
| 152.5 | 30 |
| 150.0 | 20 |
| 139.0 | 10 |
| A + B | |
| 79.0E | 1.5 |
| B | |
| 80.1 | 0 |

1150. (383)
B = $C_{10}H_9N$
α-Naphthylamine

1150.—*(Continued)*

| °C | Mol % A |
|---|---|
| A | |
| 169.2 | 100 |
| A + AB | |
| 57.5U | 13.5 |
| AB + B | |
| 45.3E | 6 |
| B | |
| 48.0 | 0 |

1151. (232)
B = $C_{10}H_9N$
β-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 168.0 | 100 |
| A + $AB_2$ | |
| 138.5E | 47.5 |
| $AB_2$ | |
| **141.7** | **27.8** |
| $AB_2$ + B | |
| 107.5E | 1.5 |
| B | |
| 109.0 | 0 |

1152. (217)
B = $C_{10}H_{10}O_3$
p-Methoxy-cinnamic acid

| °C | Mol % A |
|---|---|
| A | |
| 169.0 | 100 |
| 157.3 | 79.8 |
| 145.4 | 59.8 |
| A + B | |
| 140.8E | 55 |
| B | |
| 149.7 | 40 |
| 156.2 | 30 |
| 161.7 | 19.9 |
| 167.3 | 10 |
| 170.6 | 0 |
| Liquid crystals | |
| 170.6 | 8 |
| 174.7–170.5 | 5.7 |
| 179.9–177.6 | 3.19 |
| 185.5 | 0 |

1153. (97, 98, 253)
B = $C_{10}H_{16}O$
Camphor

1153.—*(Continued)*

| °C | Mol % A |
|---|---|
| A + AB | |
| 62.0U | 37.5 |
| AB + B | |
| 49.0E | 33.3 |
| B | |
| 63.0 | 30 |
| 84.0 | 25 |
| 103.5 | 20 |
| 122.5 | 15 |
| 141.5 | 10 |
| 161.0 | 5 |
| 178.0 | 0 |

1154. (234)
B = $C_{10}H_{16}O$
Fenchone

| °C | Wt. % A |
|---|---|
| A | |
| 169.0 | 100 |
| No solid phase | |
| 34.0 to 0 | 18.8 to 4.8 |
| B | |
| 5.3 | 0 |

1155. (36)
B = $C_{10}H_{18}O$
Cineole

| A | |
|---|---|
| 170.0 | 100 |
| A + $AB_2$ | |
| 103.0E | 30 |
| $AB_2$ | |
| **+106.5** | **26.32** |
| $AB_2$ + B | |
| − 2.0E | 1 |
| B | |
| + 1.0 | 0 |

1156. (238)
B = $C_{11}H_{12}N_2O$
Antipyrine

| A | |
|---|---|
| 168.0 | 100 |
| A + $A_3B_2$ | |
| 116.0E | 58.5 |
| $A_3B_2$ | |
| **129.0** | **46.7** |
| $A_3B_2$ + $AB_2$ | |
| 118.0E | 34 |
| $AB_2$ | |
| **129.0** | **22.6** |
| $AB_2$ + B | |
| 101.0E | 4.7 |
| B | |
| 109.8 | 0 |

1157. (263)
B = $C_{12}H_9N$
Carbazole

| A | |
|---|---|
| 168.0 | 100 |
| A + B | |
| 163.0E | 85 |
| B | |
| 235.8 | 0 |

1157.1. (274.2)
B = $C_{12}H_{10}N_2$
Azobenzene

| °C | Wt. % A |
|---|---|
| A | |
| 170.0 | 100 |
| A + B | |
| 55.0E | 1.0 |
| B | |
| 67 | 0 |

1158. (261)
B = $C_{12}H_{11}N$
Diphenylamine

| A | |
|---|---|
| 168.2 | 100 |
| A + B | |
| 51.0E | 1 |
| B | |
| 52.0 | 0 |

1159. (262)
B = $C_{13}H_9N$
Acridine

| A | |
|---|---|
| 169.0 | 100 |
| 164.0 | 90 |
| A + $AB_2$ | |
| 159.0E | 77 |
| $AB_2$ | |
| 166.0 | 70 |
| 178.0 | 60 |
| 189.0 | 50 |
| 199.0 | 40 |
| 206.5 | 30 |
| **209.5** | **20** |
| 201.7 | 10 |
| 187.0 | 5 |
| $AB_2$ + B | |
| 105.5E | *ca.* 1 |
| B | |
| 106.5 | 0 |

1160. (274)
B = $C_{13}H_{10}O$
Benzophenone

| A | |
|---|---|
| 170.4 | 100 |
| A + B | |
| 41.3E | 11 |
| B | |
| 47.0 | 0 |

1161. (235)
B = $C_{13}H_{12}$
Diphenylmethane

| A | |
|---|---|
| 168.8 | 100 |
| 160–162 | 70–30 |
| A + B | |
| 23.9E | *ca.* 0 |
| B | |
| 23.9 | 0 |

1161.1. (234.1)
B = $C_{13}H_{12}O$
Benzhydrol

| A | |
|---|---|
| 169.0 | 100 |

1161.1.—*(Cont'd)*

| °C | Wt. % A |
|---|---|
| A + B | |
| 58.0E | 2.5 |
| B | |
| 64.5 | 0 |

1162. (217)
B = $C_{14}H_{14}N_2O_3$
p-Azoxyanisole

| °C | Mol % A |
|---|---|
| A | |
| 169.0 | 100 |
| 162.0 | 90 |
| 156.0 | 80 |
| 151.0 | 70 |
| 146.0 | 60 |
| 139.5 | 50 |
| 128.0 | 40 |
| A + B | |
| 106.2E | 25.6 |
| B | |
| 108.0 | 20 |
| 111.0 | 10 |
| 114.0 | 0 |
| Liquid crystals | |
| 113.5–116.3 | 8 |
| 119.0–121.0 | 6 |
| 124.5–125.7 | 4 |
| 130.0–130.3 | 2 |
| 135.0 | 0 |

1163. (254)
B = $C_{19}H_{16}$
Triphenylmethane

| °C | Wt. % A |
|---|---|
| A | |
| 168.5 | 100 |
| 160 | 80 to 13 |
| A + B | |
| 91.0E | *ca.* 0 |
| B | |
| 91.0 | 0 |
| Two liquid phases | |
| 160.0Trp. | 80 13 |
| 173 | 63.7 27.3 |
| 175 | 59.5 29.9 |
| 176 | 55.1 33.8 |
| 177.0crit. | 45 |

1164. (271)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| A | |
|---|---|
| 169.0 | 100 |
| A + $A_2B$ | |
| 145.2E | 52.2 |
| $A_2B$ | |
| **151.6** | **42.5** |
| $A_2B$ + B | |
| 139.8E | 18.5 |
| B | |
| 159.2 | 0 |

*v. also* 301, 377, 447, 458.8, 459.71, 483, 559, 806, 1085, 1110, 1860, 1864, 1866

**$C_6H_6O_3$**
Pyrogallol

1165. (273)
B = $C_6H_7N$
Aniline

| °C | Wt. % A |
|---|---|
| A | |
| 126.0 | 100 |
| A + $AB_2$ | |
| 48.4E | 48 |
| $AB_2$ | |
| **+49.0** | **40.3** |
| $AB_2$ + B | |
| −13.0 | 12 |
| B | |
| − 6.7 | 0 |

1166. (247)
B = $C_6H_7NO$
m-Aminophenol

| A | |
|---|---|
| 129.0 | 100 |
| A + B | |
| 77.0E | 48 |
| B | |
| 118.0 | 0 |

1167. (273)
B = $C_6H_8N_2$
o-Phenylenediamine

| A | |
|---|---|
| 126.0 | 100 |
| A + AB | |
| 88.0E | 69 |
| AB | |
| **93.6** | **53.8** |
| AB + B | |
| 74.2E | 30 |
| B | |
| 100.9 | 0 |

1168. (273)
B = $C_6H_8N_2$
m-Phenylenediamine

| A | |
|---|---|
| 126.0 | 100 |
| A + AB | |
| 75.0E | 67 |
| AB | |
| **79.0** | **53.8** |
| AB + B | |
| 31.0E | 21.5 |
| B | |
| 61.0 | 0 |

1169. (273)
B = $C_6H_8N_2$
p-Phenylenediamine

| A | |
|---|---|
| 126.0 | 100 |
| A + $A_2B$ | |
| 98.0E | 78 |
| $A_2B$ | |
| **106.0** | **69.9** |
| $A_2B$ + AB | |
| 104.0E | 66.5 |
| AB | |
| **110.0** | **53.8** |
| AB + B | |
| 98.0E | 32.5 |

1169.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 139.8 | 0 |

1170. *v.* p. 178
B = $C_7H_6O_2$
*m*-Hydroxybenzaldehyde

1171. (273)
B = $C_7H_7NO$
Benzamide

| °C | Wt. % A |
|---|---|
| A | |
| 126.1 | 100 |
| A + AB | |
| 78.0E | 63.5 |
| AB | |
| **83.0** | **51** |
| AB + B | |
| 76.0E | 37.5 |
| B | |
| 124.8 | 0 |

1172. (273)
B = $C_7H_9N$
*p*-Toluidine

| °C | Wt. % A |
|---|---|
| A | |
| 125.5 | 100 |
| A + $AB_2$ | |
| 53.8E | 46 |
| $AB_2$ | |
| **57.0** | **37** |
| $AB_2$ + B | |
| 36.0E | 14 |
| B | |
| 44.0 | 0 |

1173. (249)
B = $C_8H_8O$
Acetophenone

| °C | Wt. % A |
|---|---|
| A | |
| 126.0 | 100 |
| A + AB | |
| 21.0U | 39 |
| AB + B | |
| 4.0E | 23 |
| B | |
| 20.0 | 0 |

1173.1. (274.1)
B = $C_9H_8O_2$
Cinnamic acid

| °C | Wt. % A |
|---|---|
| A | |
| 130.5 | 100 |
| A + B | |
| 101.0E | 44.0 |
| B | |
| 133.0 | 0 |

1174. (273)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 126.0 | 100 |
| A + AB | |
| 41.7U | 36 |
| AB + B | |
| 32.2E | 14 |
| B | |
| 48.5 | 0 |

1175. (273)
B = $C_{10}H_9N$
β-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 126.0 | 100 |
| A + $AB_2$ | |
| 108.3E | 64 |
| $AB_2$ | |
| **122.5** | **30.4** |
| $AB_2$ + B | |
| 105.0E | 6 |
| B | |
| 109.0 | 0 |

1176. (206, 253)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 130.8 | 100 |
| 125.8 | 90 |
| 118.8 | 80 |
| 108.5 | 70 |
| 94.0 | 60 |
| 73.0 | 50 |
| 62.0 | 45 |
| 49.0 | 40 |
| 35.0 | 35 |
| A + B | |
| 21.0E | 31 |
| B | |
| 80.0 | 25 |
| 109.0 | 20 |
| 130.0 | 15 |
| 148.0 | 10 |
| 163.0 | 5 |
| 178.0 | 0 |

1177. (234)
B = $C_{10}H_{16}O$
Fenchone

| °C | Wt. % A |
|---|---|
| A | |
| 131.0 | 100 |
| No solid phase | |
| 18.0 to | 31.9 to |
| −2.5 | 11.4 |
| B | |
| +5.0 | 0 |

1178. (238)
B = $C_{11}H_{12}N_2O$
Antipyrine

| | |
|---|---|
| A | |
| 126.0 | 100 |
| No solid phase | |
| 59 to | 63.8 to |
| 59.5 | 21.2 |
| B | |
| 109.8 | 0 |

1179. *v.* p. 178
B = $C_{12}H_9N$
Carbazole

1179.1. (274.2)
B = $C_{12}H_{10}N_2$
Azobenzene

1179.1.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 132.0 | 100 |
| A + B | |
| 65.0E | *ca.* 0 |
| B | |
| 67 | 0 |

1180. (261)
B = $C_{12}H_{11}N$
Diphenylamine

| | |
|---|---|
| A | |
| 126.0 | 100 |
| A + B | |
| 51.0E | 1 |
| B | |
| 52.0 | 0 |

1181. (274)
B = $C_{13}H_{10}O$
Benzophenone

| | |
|---|---|
| A | |
| 126.0 | 100 |
| A + B | |
| 32.9E | 18.5 |
| B | |
| 47.0 | 0 |

1182. (235)
B = $C_{13}H_{12}$
Diphenylmethane

| | |
|---|---|
| A | |
| 126.0 | 100 |
| 115.2 | 90 to 8 |
| A + B | |
| 23.5E | 1 |
| B | |
| 23.9 | 0 |
| Two liquid phases | |
| 115.2Trp. | 90 8 |
| 120 | 78 20 |
| 122 | 68 31 |
| 122.9crit. | 50 |

1182.1. (234.1)
B = $C_{13}H_{12}O$
Benzhydrol

| | |
|---|---|
| A | |
| 131.0 | 100 |
| A + B | |
| 53.0E | 22.0 |
| B | |
| 64.5 | 0 |

1183. (254)
B = $C_{19}H_{16}$
Triphenylmethane

| | |
|---|---|
| A | |
| 126.0 | 100 |
| 125.0 | 95 to 12 |
| A + B | |
| 89.0E | 2.5 |
| B | |
| 91.0 | 0 |
| Two liquid phases | |
| 125.0Trp. | 95 12 |
| 140 | 91 18 |

1183.—(*Continued*)

| °C | Wt. % A |
|---|---|
| Two liquid phases | |
| 150 | 78 29 |
| 160 | 69 36 |
| 178.5crit. | 52 |

1184. (243)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| A | |
| 132.0 | 100 |
| A + $A_3B_2$ | |
| 76.0E | 51 |
| $A_3B_2$ | |
| **97.0** | **42** |
| $A_3B_2$ + B | |
| 65.0E | 30 |
| B | |
| 159.0 | 0 |

*v. also* 302, 378, 448, 458.81, 459.8, 484, 1860

## $C_6H_7N$
Aniline

1185. (242)
B = $C_6H_7NO$
*m*-Aminophenol

| °C | Mol % A |
|---|---|
| A | |
| − 6.0 | 100 |
| − 10.2 | 95 |
| A + B | |
| − 16.5E | 87.5 |
| B | |
| + 18.8 | 80 |
| 44.5 | 70 |
| 61.6 | 60 |
| 75.8 | 50 |
| 87.6 | 40 |
| 97.7 | 30 |
| 106.8 | 20 |
| 113.5 | 10 |
| 119.2 | 5 |
| 123.0 | 0 |

1186. (408)
B = $C_6H_7NO$
*p*-Aminophenol

| °C | Wt. % A |
|---|---|
| −6.00 | 100 |
| −6.58 | 99 |
| −7.16 | 98 |
| −7.74 | 97 |

1187. (408)
B = $C_6H_7NO$
Phenylhydroxylamine

| | |
|---|---|
| −6.00 | 100 |
| −6.47 | 99 |
| −6.94 | 98 |
| −7.41 | 97 |

1188. (408)
B = $C_6H_8N_2$
*m*-Phenylenediamine

1188.—(*Continued*)

| °C | Wt. % A |
|---|---|
| −6.00 | 100 |
| −6.60 | 99 |
| −7.18 | 98 |
| −7.75 | 97 |

1189. (222)
B = $C_7H_5N_3O_6$
Trinitrotoluene

| °C | Mol % A |
|---|---|
| A | |
| − 5.5 | 100 |
| A + AB | |
| − 8.0E | 98.5 |
| AB | |
| + 35.0 | 88.7 |
| 71.0 | 76.6 |
| 77.0 | 59.5 |
| **85.0** | **50.0** |
| 84.0 | 41.2 |
| 78.0 | 29.8 |
| AB + B | |
| 60E | 15 |
| B | |
| 74.5 | 8.1 |
| 82.0 | 0 |

1190. (8, 12)
B = $C_7H_6O_2$
Benzoic acid

| | |
|---|---|
| A | |
| − 6.0 | 100 |
| A + AB | |
| − 9.0E | 96 |
| AB | |
| + 8.5 | 90 |
| 31.8 | 80 |
| 48.0 | 70 |
| AB + B | |
| 56.0U | 60 |
| B | |
| 72.3 | 50 |
| 86.0 | 40 |
| 97.5 | 30 |
| 107.0 | 20 |
| 114.7 | 10 |
| 121.25 | 0 |

1191. (222)
B = $C_7H_6N_2O_4$
2, 4-Dinitrotoluene

| | |
|---|---|
| A | |
| − 5.5 | 100 |
| − 11.5 | 91.6 |
| A + B | |
| − 13.0E | 89 |
| B | |
| 0.0 | 79.1 |
| + 20.0 | 64.7 |
| 31.0 | 55.4 |
| 41.0 | 44.8 |
| 49.0 | 35.8 |
| 56.0 | 26.0 |
| 65.0 | 11.0 |
| 71.0 | 0.0 |

1192. (259)
B = $C_7H_6N_2O_4$
2, 6-Dinitrotoluene

1192.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| − 5.5 | 100.0 |
| −10.5 | 92.7 |
| A + B | |
| −13.0E | 88.8 |
| B | |
| + 0.5 | 78.9 |
| 14.0 | 68.0 |
| 25.0 | 55.4 |
| 35.5 | 40.6 |
| 41.8 | 29.3 |
| 62.0 | 0.0 |

1193. (244)
B = $C_7H_6N_2O_4$
3, 4-Dinitrotoluene

| °C | Wt. % A |
|---|---|
| A | |
| − 5.8 | 100 |
| A + B | |
| −17.0E | 69 |
| B | |
| +58.5 | 0 |

1194. (244, 259)
B = $C_7H_6N_2O_4$
3, 5-Dinitrotoluene

| | |
|---|---|
| A | |
| − 6.0 | 100 |
| A + AB | |
| −12.9E | 92.5 |
| AB | |
| **+46.5** | **33.8** |
| AB + B | |
| 46.0E | 32 |
| B | |
| 82.3 | 0 |

1195. *v.* p. 178
B = $C_7H_7NO_2$
*p*-Nitrotoluene

1196. (223)
B = $C_7H_8O$
*o*-Cresol

| °C | Mol % A |
|---|---|
| A | |
| − 6.3 | 100 |
| − 9.3 | 95 |
| −12.5 | 90 |
| A + AB | |
| −18.0E | 82.2 |
| AB | |
| − 1.2 | 70 |
| + 6.6 | 60 |
| 8.0 | 55 |
| **8.4** | **50** |
| 8.2 | 45 |
| 7.2 | 40 |
| AB + B | |
| 4.0E | 31 |
| B | |
| 14.3 | 20 |
| 22.8 | 10 |
| 26.8 | 5 |
| 30.4 | 0 |

**$C_6H_7N$.—**
(*Continued*)

1197. (223)
B = $C_7H_8O$
*m*-Cresol

| °C | Mol % A |
|---|---|
| | A |
| − 6.3 | 100 |
| − 9.3 | 95 |
| −13.5 | 90 |
| | A + AB |
| −29.5E | 76.7 |
| | AB |
| −22.8 | 70 |
| −16.1 | 60 |
| −14.7 | 55 |
| **−14.5** | **50** |
| −15.2 | 45 |
| −18.3 | 40 |
| | AB + B |
| −29.5E | 31 |
| | B |
| −15.4 | 20 |
| − 4.5 | 10 |
| + 0.2 | 5 |
| 4.2 | 0 |

1198. (223)
B = $C_7H_8O$
*p*-Cresol

| | |
|---|---|
| | A |
| − 6.3 | 100 |
| − 9.7 | 95 |
| | A + AB |
| −15.0E | 89 |
| | AB |
| + 0.5 | 80 |
| 12.0 | 70 |
| 17.9 | 60 |
| 18.9 | 55 |
| **19.2** | **50** |
| 18.7 | 45 |
| 17.0 | 40 |
| | AB + B |
| 5.8E | 25.7 |
| | B |
| 12.8 | 20 |
| 23.8 | 10 |
| 28.7 | 5 |
| 33.2 | 0 |

1199. (408)
B = $C_7H_9N$
*o*-Toluidine

| °C | Wt. % A |
|---|---|
| − 6.00 | 100 |
| − 6.60 | 99 |
| − 7.18 | 98 |
| − 7.75 | 97 |
| − 8.33 | 96 |
| − 8.95 | 95 |
| − 9.53 | 94 |
| −10.11 | 93 |

1201. *v.* p. 178
B = $C_7H_9N$
*p*-Toluidine

1202. (219)
B = $C_8H_{10}N_2O$
Nitrosodimethylaniline

| °C | Mol % A |
|---|---|
| | A |
| − 5.5 | 100 |
| | A + $AB_2$ |
| − 8.5E | 97 |
| | $AB_2$ |
| + 24.0 | 90 |
| 50.0 | 80 |
| 69.5 | 70 |
| 80.0 | 60 |
| 87.0 | 50 |
| 89.6 | 45 |
| 91.4 | 40 |
| **92.4** | **33.3** |
| 92.0 | 30 |
| 90.5 | 25 |
| 87.8 | 20 |
| 82.2 | 15 |
| | $AB_2$ + B |
| 74.5E | 11 |
| | B |
| 82.5 | 5 |
| 85.5 | 0 |

1203. (408)
B = $C_8H_{11}N$
Xylidene

| °C | Wt. % A |
|---|---|
| −6.00 | 100 |
| −7.00 | 99 |
| −7.75 | 98 |
| −8.48 | 97 |
| −9.00 | 96 |

1204. (247)
B = $C_{10}H_8O$
α-Naphthol

| | |
|---|---|
| | A |
| − 6.0 | 100 |
| | A + $A_2B$ |
| −14.0E | 89 |
| | $A_2B$ |
| **+28.0** | **56.3** |
| | $A_2B$ + AB |
| 26.5E | 50.5 |
| | AB |
| **32.0** | **39.2** |
| | AB + B |
| 31.5E | 36.5 |
| | B |
| 90.5 | 0 |

1205. (247)
B = $C_{10}H_8O$
β-Naphthol

| | |
|---|---|
| | A |
| − 6.0 | 100 |
| | A + AB |
| − 7.0E | 96 |
| | AB |
| **+82.2** | **39.2** |
| | AB + B |
| 80.5E | 30 |

1205.—(*Continued*)

| °C | Wt. % A |
|---|---|
| | B |
| 121.8 | 0 |

1205.1. (475)
B = $C_{10}H_9N$
β-Naphthylamine

| °C | Mol % A |
|---|---|
| 0.0? | 97.5 |
| 2.0? | 95 |
| 8.0 | 90 |
| 45.0 | 80 |
| 60.0 | 70 |
| 70.0 | 60 |
| 78.0 | 50 |
| 85.5 | 40 |
| 92.5 | 30 |
| 99.5 | 20 |
| 105.0 | 10 |
| 108.0 | 5 |
| 110.6 | 0 |

1206. (475)
B = $C_{12}H_9N$
Carbazole

| °C | g B per 100 g A |
|---|---|
| 30.0 | 3.0 |
| 40.0 | 3.7 |
| 50.0 | 4.8 |
| 60.0 | 6.0 |
| 70.0 | 7.7 |
| 80.0 | 9.8 |
| 100.0 | 16.0 |
| 120.0 | 28.0 |
| 140.0 | 46.0 |
| 160.0 | 74.0 |

1207. *v.* p. 178
B = $C_{12}H_{10}$
Acenaphthene

1208. *v.* p. 178
B = $C_{13}H_{10}$
Fluorene

1209. *v.* p. 178
B = $C_{14}H_8O_2$
Anthraquinone

1210. (475)
B = $C_{14}H_{10}$
Anthracene

| °C | g B per 100 g A |
|---|---|
| 20.0 | 0.7 |
| 30.0 | 1.0 |
| 40.0 | 1.45 |
| 50.0 | 2.05 |
| 60.0 | 2.82 |
| 70.0 | 3.9 |
| 80.0 | 5.45 |
| 90.0 | 7.75 |
| 100.0 | 10.7 |

1211. *v.* p. 178
B = $C_{14}H_{10}$
Phenanthrene

1212. (147, 254)
B = $C_{19}H_{16}$
Triphenylmethane

| °C | Mol % A |
|---|---|
| | B |
| 91.0 | 100 |
| | AB + B |
| 70.0E | 61 |
| | AB |
| **71.5** | **50** |

*v. also* 45, 276, 436.1, 438.1, 455, 467, 560, 680, 689, 694, 698, 710, 733, 756, 774, 836, 846, 855, 872, 901, 925, 963, 1041, 1086, 1111, 1139, 1165; *v. also* Seidell, p. 433

**$C_6H_7NO$**
*o*-Aminophenol

1214. (36)
B = $C_{10}H_{18}O$
Cineole

| °C | Wt. % A |
|---|---|
| | A |
| 170.0 | 100 |
| | A + B |
| 0.0 | 2.5 |
| | B |
| 1.0 | 0 |

*v. also* 964

**$C_6H_7NO$**
*m*-Aminophenol

1215. (242)
B = $C_6H_8N_2$
*o*-Phenylenediamine

| | |
|---|---|
| | A |
| 118.0 | 100 |
| | A + B |
| 63.0E | 45 |
| | B |
| 100.5 | 0 |

1216. (242)
B = $C_6H_8N_2$
*m*-Phenylenediamine

| | |
|---|---|
| | A |
| 118.0 | 100 |
| | A + B |
| 24.0E | 37 |
| | B |
| 62.0 | 0 |

1217. (242)
B = $C_6H_8N_2$
*p*-Phenylenediamine

| | |
|---|---|
| | A |
| 118.0 | 100 |
| | A + $A_2B$ |
| 94.0E | 77 |
| | $A_2B$ |
| **97.0** | **66.6** |
| | $A_2B$ + AB |
| 95.0E | 62 |

1217.—(*Continued*)

| °C | Wt. % A |
|---|---|
| | AB |
| **102.5** | **50.2** |
| | AB + B |
| 101.0 | 44 |
| | B |
| 138.5 | 0 |

1218. (247)
B = $C_7H_6N_2O_4$
2, 4-Dinitrotoluene

| | |
|---|---|
| | A |
| 118.0 | 100 |
| | A + B |
| 65.0E | 10 |
| | B |
| 71.0 | 0 |

1219. (242)
B = $C_7H_9N$
*p*-Toluidine

| | |
|---|---|
| | A |
| 118.0 | 100 |
| | A + AB |
| 50.0U | 35 |
| | AB + B |
| 37.0E | 13 |
| | B |
| 44.0 | 0 |

1220. (247)
B = $C_{10}H_8O$
α-Naphthol

| | |
|---|---|
| | A |
| 118.0 | 100 |
| | A + B |
| 69.0E | 30 |
| | B |
| 92.0 | 0 |

1221. (247)
B = $C_{10}H_8O$
β-Naphthol

| | |
|---|---|
| | A |
| 118.0 | 100 |
| | A + AB |
| 97.5E | 58.5 |
| | AB |
| **99.0** | **43.5** |
| | AB + B |
| 96.0E | 26 |
| | B |
| 121.5 | 0 |

1222. (242)
B = $C_{10}H_9N$
α-Naphthylamine

| | |
|---|---|
| | A |
| 118.0 | 100 |
| | A + B |
| 36.0E | 16 |
| | B |
| 48.0 | 0 |

1223. (242)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| | A |
| 118.0 | 100 |

1223.—(*Continued*)

| °C | Wt. % A |
|---|---|
| | A + AB |
| 90.5E | 49 |
| | AB |
| **91.0** | **43.3** |
| | AB + B |
| 90.0E | 29 |
| | B |
| 108.8 | 0 |

1224. (36)
B = $C_{10}H_{18}O$
Cineole

| | |
|---|---|
| | A |
| 123.0 | 100 |
| | A + B |
| −3.0E | 4 |
| | B |
| + 1.0 | 0 |

*v. also* 711, 734, 873, 902, 926, 965, 1042, 1087, 1112, 1140, 1166, 1185

**$C_6H_7NO$**
*p*-Aminophenol

1225. (242)
B = $C_7H_9N$
*p*-Toluidine

| °C | Wt. % B |
|---|---|
| | B |
| 43.5 | 100 |
| | A + B |
| 41.0E | 95 |
| | A |
| 149.0 | 45.5 |

1226. (247)
B = $C_{10}H_8O$
α-Naphthol

| | |
|---|---|
| | B |
| 92.5 | 100 |
| | A + B |
| 82.0E | 86 |
| | A |
| 147.0 | 62.1 |

1227. (247)
B = $C_{10}H_8O$
β-Naphthol

| | |
|---|---|
| | B |
| 121.5 | 100 |
| | A + B |
| 106E | 83 |
| | A |
| 160 | 43 |

*v. also* 966, 1043, 1113, 1186

**$C_6H_7NO$**
Phenylhydroxylamine
*v.* 1187

**$C_6H_8N_2$**
o-Phenylenediamine
1228. (250)
B = $C_7H_5N_3O_6$
Trinitrotoluene

| °C | Wt. % A |
|---|---|
| A | |
| 101.0 | 100 |
| A + AB | |
| 83.0E | 57 |
| AB | |
| **97.5** | **32.2** |
| AB + B | |
| 65.0E | 9 |
| B | |
| 81.0 | 0 |

1229. (264)
B = $C_7H_6N_2O_4$
2, 4-Dinitrotoluene

| A | |
|---|---|
| 99.8 | 100 |
| A + B | |
| 51.9E | 21.5 |
| B | |
| 69.0 | 0 |

1230. (269)
B = $C_8H_{10}N_2O$
Nitrosodimethyl-aniline

| A | |
|---|---|
| 100.2 | 100 |
| A + AB | |
| 87.0E | 71 |
| AB | |
| **99.0** | **41.8** |
| AB + B | |
| 67.7E | 12.5 |
| B | |
| 84.5 | 0 |

1231. (264)
B = $C_{10}H_8O$
α-Naphthol

| A | |
|---|---|
| 99.8 | 100 |
| A + AB | |
| 58.2E | 56 |
| AB | |
| **60.0** | **42.8** |
| AB + B | |
| 58.0E | 26 |
| B | |
| 92.0 | 0 |

1232. (264)
B = $C_{10}H_8O$
β-Naphthol

| A | |
|---|---|
| 99.8 | 100 |
| A + AB | |
| 79.0E | 65 |
| AB | |
| **86.0** | **42.8** |
| AB + B | |
| 80.5E | 28 |
| B | |
| 122.0 | 0 |

1233. (240)
B = $C_{10}H_8O_2$
1, 4-Dihydroxy-naphthalene

1235. (240)
B = $C_{10}H_8O_2$
1, 6-Dihydroxy-naphthalene

| °C | Wt. % A |
|---|---|
| A | |
| 103.0 | 100 |
| A + AB | |
| 62.0E | 61 |
| AB | |
| **95.0** | **40.3** |
| AB + B | |
| 76.0E | 32 |
| B | |
| 134.0 | 0 |

1236. (240)
B = $C_{10}H_8O_2$
1, 8-Dihydroxy-naphthalene

| A | |
|---|---|
| 103.0 | 100 |
| A + AB | |
| 93.0E | 85 |
| AB | |
| **151.0** | **40.3** |
| AB + B | |
| 117.0E | 7 |
| B | |
| 137.0 | 0 |

1237. (240)
B = $C_{10}H_8O_2$
2, 3-Dihydroxy-naphthalene

1238. (240)
B = $C_{10}H_8O_2$
2, 6-Dihydroxy-naphthalene

| A | |
|---|---|
| 103.0 | 100 |
| A + $A_3B_2$ | |
| 99.0E | 92 |
| $A_3B_2$ | |
| **150** | **50.3** |
| $A_3B_2$ + B | |
| 124.0E | 30 |
| B | |
| 216.0 | 0 |

1239. (240)
B = $C_{10}H_8O_2$
2, 7-Dihydroxy-naphthalene

| A | |
|---|---|
| 103.0 | 100 |
| A + $A_3B_2$ | |
| 96.0E | 91 |
| $A_3B_2$ | |
| **140.0** | **50.3** |
| $A_3B_2$ + B | |
| 101.0E | 38 |
| B | |
| 186.0 | 0 |

1239.1. (234.1)
B = $C_{13}H_{12}O$
Benzhydrol

| °C | Wt. % A |
|---|---|
| A | |
| 102.5 | 100 |
| A + B | |
| 47.0E | 21.0 |
| B | |
| 64.5 | 0 |

1240. (251)
B = $C_{19}H_{16}$
Triphenylmethane

| A | |
|---|---|
| 101.0 | 100 |
| A + B | |
| 76.5E | 12.5 |
| Immiscible liquids | |
| 89.0 | 50–29 |
| B | |
| 91.0 | 0 |

*v. also* 485, 561, 712, 735, 757, 775, 874, 903, 927, 958.1, 966.1, 1045, 1088, 1114, 1141, 1167, 1215

**$C_6H_8N_2$**
m-Phenylenediamine
1241. (250)
B = $C_7H_5N_3O_6$
Trinitrotoluene

| A | |
|---|---|
| 62.0 | 100 |
| A + AB | |
| 57.5E | 90.5 |
| AB | |
| **105.0** | **32.2** |
| AB + B | |
| 70.0E | 6 |
| B | |
| 81.0 | 0 |

1242. (264)
B = $C_7H_6N_2O_4$
2, 4-Dinitrotoluene

| A | |
|---|---|
| 62.0 | 100 |
| A + B | |
| 35.0E | 55 |
| B | |
| 69.2 | 0 |

1243. (269)
B = $C_8H_{10}N_2O$
Nitrosodimethyl-aniline

| A | |
|---|---|
| 61.0 | 100 |
| A + $AB_2$ | |
| 48.0E | 84 |
| $AB_2$ | |
| **96.5** | **26.5** |
| $AB_2$ + B | |
| 73.5E | 11 |
| B | |
| 84.5 | 0 |

1244. (264)
B = $C_{10}H_8O$
α-Naphthol

| A | |
|---|---|
| 62.0 | 100 |
| A + AB | |
| 31.0E | 69 |
| AB | |
| **35.0** | **42.8** |
| AB + B | |
| 32.0E | 31 |
| B | |
| 92.0 | 0 |

1245. (264)
B = $C_{10}H_8O$
β-Naphthol

| A | |
|---|---|
| 62.0 | 100 |
| A + $AB_2$ | |
| 59.0E | 97 |
| $AB_2$ | |
| **114.0** | **27.3** |
| $AB_2$ + B | |
| 103.0E | 11 |
| B | |
| 122.0 | 0 |

1246. (240)
B = $C_{10}H_8O_2$
1, 4-Dihydroxy-naphthalene

| A | |
|---|---|
| 63.5 | 100 |
| A + AB | |
| 55.0E | 92.5 |
| AB | |
| **124.0** | **40.3** |
| AB + B | |
| ? | ? |
| B | |
| 183.0 | 0 |

1247. (240)
B = $C_{10}H_8O_2$
1, 6-Dihydroxy-naphthalene

| A | |
|---|---|
| 63.0 | 100 |
| A + AB | |
| 49.0E | 89 |
| AB | |
| **125.0** | **40.3** |
| AB + B | |
| 87.0E | 22 |
| B | |
| 134.0 | 0 |

1248. (240)
B = $C_{10}H_8O_2$
1, 8-Dihydroxy-naphthalene

| A | |
|---|---|
| 63.0 | 100 |
| A + AB | |
| 58.0E | 92 |
| AB | |
| **101.0** | **40.3** |

1248.—(*Continued*)

| °C | Wt. % A |
|---|---|
| AB + B | |
| 75.0E | 32 |
| B | |
| 137.0 | 0 |

1249. (240)
B = $C_{10}H_8O_2$
2, 3-Dihydroxy-naphthalene

| A | |
|---|---|
| 63.0 | 100 |
| A + AB | |
| 53.0E | 94 |
| AB | |
| **149.0** | **40.3** |
| AB + B | |
| 122.0E | 24 |
| B | |
| 162.0 | 0 |

1250. (240)
B = $C_{10}H_8O_2$
2, 6-Dihydroxy-naphthalene

| A | |
|---|---|
| 63.0 | 100 |
| A + AB | |
| 61.0E | 98 |
| AB | |
| **171.0** | **40.3** |
| AB + B | |
| 125.0E | 35 |
| B | |
| 216.0 | 0 |

1251. (240)
B = $C_{10}H_8O_2$
2, 7-Dihydroxy-naphthalene

| A | |
|---|---|
| 63.0 | 100 |
| A + AB | |
| 53.0E | 98 |
| AB | |
| **139.0** | **40.3** |
| AB + B | |
| 126.0E | 33 |
| B | |
| 186.0 | 0 |

1252. (251, 254)
B = $C_{19}H_{16}$
Triphenylmethane

| A | |
|---|---|
| 62.0 | 100 |
| A + B | |
| 57.0E | 96 |
| Immiscible liquids | |
| 80 | 74–7 |
| B | |
| 90.8 | 0 |

There is some evidence for an equimolecular compound

1253. (243)
B = $C_{19}H_{16}O$
Triphenyl carbinol

1253.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 62.0 | 100 |
| A + B | |
| 59.5E | 90 |
| B | |
| 159.5 | 0 |

*v. also* 486, 562, 713, 736, 758, 776, 875, 904, 928, 958.2, 966.2, 1046, 1089, 1115, 1142, 1168, 1188, 1216

**$C_6H_8N_2$**
p-Phenylenediamine
1254. (250)
B = $C_7H_5N_3O_6$
Trinitrotoluene

| A | |
|---|---|
| 140.0 | 100 |
| A + AB | |
| 88.0E | 38 |
| AB | |
| **93.0** | **32.2** |
| AB + B | |
| 64.0E | 8 |
| B | |
| 81.0 | 0 |

1255. (264)
B = $C_7H_6N_2O_4$
2, 4-Dinitrotoluene

| A | |
|---|---|
| 138.0 | 100 |
| A + B | |
| 49.0E | 28 |
| B | |
| 69.0 | 0 |

1256. (269)
B = $C_8H_{10}N_2O$
Nitrosodimethyl-aniline

| A | |
|---|---|
| 139.1 | 100 |
| A + $AB_2$ | |
| 75.5E | 39 |
| $AB_2$ | |
| **93.0** | **26.5** |
| $AB_2$ + B | |
| 65.0E | 10 |
| B | |
| 84.5 | 0 |

1257. (264)
B = $C_{10}H_8O$
α-Naphthol

| A | |
|---|---|
| 138.0 | 100 |
| A + $AB_2$ | |
| 95.0E | 50 |
| $AB_2$ | |
| **110** | **27.3** |
| $AB_2$ + B | |
| 84.0E | 7 |
| B | |
| 92.0 | 0 |

**$C_6H_8N_2$.—**
*(Continued)*

1258. (264)
B = $C_{10}H_8O$
β-Naphthol

| °C | Wt. % A |
|---|---|
| A | |
| 138.0 | 100 |
| A + $AB_2$ | |
| 117.0E | 74 |
| $AB_2$ | |
| **150.5** | **27.3** |
| $AB_2$ + B | |
| 120.0E | 2 |
| B | |
| 122.0 | 0 |

1259. (240)
B = $C_{10}H_8O_2$
1, 6-Dihydroxy-naphthalene

| | |
|---|---|
| A | |
| 147.0 | 100 |
| A + AB | |
| 125.0E | 95 |
| AB | |
| **170.0** | **40.3** |
| AB + B | |
| 121.0E | 15 |
| B | |
| 134.0 | 0 |

1260. (240)
B = $C_{10}H_8O_2$
1, 8-Dihydroxy-naphthalene

| | |
|---|---|
| A | |
| 147.0 | 100 |
| A + $AB_2$ | |
| 106.0E | 37 |
| $AB_2$ | |
| **118.0** | **25.2** |
| $AB_2$ + B | |
| 109.0E | 21 |
| B | |
| 137.0 | 0 |

1261. (240)
B = $C_{10}H_8O_2$
2, 3-Dihydroxy-naphthalene

| | |
|---|---|
| A | |
| 147.0 | 100 |
| A + $AB_2$ | |
| 118.0E | 70 |
| $AB_2$ | |
| **164.0** | **25.2** |
| $AB_2$ + B | |
| 141.0E | 4 |
| B | |
| 162.0 | 0 |

1262. (240)
B = $C_{10}H_8O_2$
2, 6-Dihydroxy-naphthalene

| | |
|---|---|
| A | |
| 147.0 | 100 |

1262.—*(Continued)*

| °C | Wt. % A |
|---|---|
| A + AB | |
| 140.0E | 95 |
| AB | |
| **212.0** | **40.3** |
| AB + B | |
| 195.0E | 10 |
| B | |
| 216.0 | 0 |

1263. (240)
B = $C_{10}H_8O_2$
2, 7-Dihydroxy-naphthalene

| | |
|---|---|
| A | |
| 147.0 | 100 |
| A + $AB_2$ | |
| 129.0E | 81 |
| $AB_2$ | |
| **180.0** | **25.2** |
| $AB_2$ + B | |
| 171.0E | 10.5 |
| B | |
| 186.0 | 0 |

1264. (235)
B = $C_{13}H_{12}$
Diphenylmethane

| | |
|---|---|
| A | |
| 138.8 | 100 |
| A + B | |
| 23.3E | 1 |
| B | |
| 23.9 | 0 |

1264.1. (234.1)
B = $C_{13}H_{12}O$
Benzhydrol

| | |
|---|---|
| A | |
| 147.0 | 100 |
| A + B | |
| 51.0E | 11.0 |
| B | |
| 64.5 | 0 |

1265. (254)
B = $C_{19}H_{16}$
Triphenylmethane

| | |
|---|---|
| A | |
| 138.8 | 100 |
| A + B | |
| 87.5E | 3 |
| B | |
| 91.0 | 0 |

1266. (243)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| A | |
| 140.0 | 100 |
| A + B | |
| 118.0E | 33 |
| B | |
| 159.5 | 0 |

*v. also* 563, 737, 759, 777, 876, 905, 929, 966.3, 1047, 1090, 1116, 1143, 1169, 1217

**$C_6H_8N_2$**
Phenylhydrazine
*v.* 1044

**$C_6H_9NO_2$**
Ethyl succinimide
1267. (375)
B = $C_7H_7Br$
*p*-Bromotoluene

| °C | Wt. % A |
|---|---|
| A | |
| 28.81 | 100.00 |
| 25.60 | 95.00 |
| 19.57 | 85.87 |
| 7.99 | 68.94 |
| 2.82 | 61.30 |
| A + B | |
| 0.5E | 58 |
| B | |
| 4.55 | 48.60 |
| 10.24 | 37.84 |
| 14.21 | 28.09 |
| 17.89 | 18.74 |
| 21.55 | 9.80 |
| 26.73 | 0.0 |

1268. (375)
B = $C_8H_{10}$
*p*-Xylene

| | |
|---|---|
| A | |
| 28.81 | 100.0 |
| 18.32 | 88.84 |
| 10.93 | 79.95 |
| +2.94 | 70.51 |
| A + B | |
| −2.6E | 63.75 |
| B | |
| −2.12 | 59.02 |
| −0.04 | 51.75 |
| +3.04 | 41.7 |
| 4.85 | 34.0 |
| 6.64 | 25.63 |
| 8.29 | 18.15 |
| 11.18 | 6.86 |
| 13.28 | 0 |

**$C_6H_{10}O$**
Cyclohexanone
*v.* 1048

**$C_6H_{10}O_4$**
Diethyl oxalate
*v.* 130

**$C_6H_{10}O_4$**
Dimethyl succinate
*v.* 129, 194, 277

**$C_6H_{10}O_4$**
Glycol diacetate
1268.1. (444.1)
B = $C_7H_5N_3O_6$
Trinitrotoluene

| °C | g B per 100 g A |
|---|---|
| 25.0 | 44.43 |

1268.2. (444.1)
B = $C_7H_5N_5O_8$
Tetryl

| °C | g B per 100 cc A |
|---|---|
| 20–25 | 16.0 |

1268.3. (444.1)
B = $C_8H_7N_3O_6$
2, 4, 6-Trinitro-*m*-xylene

| °C | g B per 100 g A |
|---|---|
| 25.0 | 0.81 |

1268.4. (444.1)
B = $C_{10}H_5N_3O_6$
Trinitro-naphthalene

| | |
|---|---|
| 25.0 | 0.90 |

*v. also* 593.1, 635.1, 655.1

**$C_6H_{12}$**
Cyclohexane
*v.* 247, 290.3, 524, 967

**$C_6H_{12}Cl_2$**
Dichlorohexane
*v.* 463

**$C_6H_{12}Cl_2S$**
Dichlorodipropyl sulfide
*v.* 464

**$C_6H_{12}O_3$**
Paraldehyde
1269. *v.* p. 178
B = $C_8H_{10}$
Xylene
*v. also* 248, 262, 968

**$C_6H_{13}N$**
*d*-Pipecoline
1270. (290)
B = $C_6H_{13}N$
*l*-Pipecoline

| °C | Mol % A |
|---|---|
| A | |
| 8.95 | 100 |
| 7.0 | 95 |
| 5.0 | 90 |
| +0.85 | 80 |
| −3.8 | 70 |
| A + AB | |
| −6.65E | 64.5 |
| AB | |
| −5.8 | 60 |
| **−4.9** | **50** |
| −5.8 | 40 |
| AB + B | |
| −6.65 | 35.5 |
| B | |
| −3.8 | 30 |
| +0.85 | 20 |
| 5.0 | 10 |
| 7.0 | 5 |
| 8.95 | 0 |

**$C_6H_{14}$**
Hexane
1271. *v.* p. 178
B = $C_{10}H_8$
Naphthalene

**$C_6H_{15}PS$**
Triethylphosphine sulfide
1272. (371)
B = $C_{18}H_{15}PS$
Triphenylphosphine sulfide

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| $t_L$ | $t_S$ |
| 95 | 100 |
| 87 | 82.5 92.57 |
| 93 | 82.5 76.00 |
| 82.5E | 60 |
| 108 | 82.5 44.66 |
| 119 | 109 34.10 |
| 129.5 | 124 25.00 |
| 141 | 137 14.92 |
| 149 | 147.5 7.32 |
| 158 | 0 |

**$C_7H_4Cl_2O_2$**
2, 3-Dichloro-benzoic acid
1277. (188)
B = $C_7H_4Cl_2O_2$
2, 5-Dichloro-benzoic acid

| °C | Mol % A |
|---|---|
| A | |
| 168.3 | 100 |
| A + $AB_2$ | |
| 127.0E | 46.0 |
| $AB_2$ | |
| **130.2** | **33.3** |
| $AB_2$ + B | |
| 130.2U | 33.3 |
| B | |
| 154.4 | 0.0 |

**$C_7H_4Cl_2O_2$**
2, 5-Dichloro-benzoic acid
1278. (188)
B = $C_7H_5ClO_2$
*m*-Chlorobenzoic acid

| | |
|---|---|
| A | |
| 154.4 | 100 |
| A + AB | |
| 121.3E | 51 |
| AB | |
| **122.3** | **50** |
| AB + B | |
| 119.6E | 40 |
| B | |
| 155.0 | 0 |

*v. also* 1277

**$C_7H_4Cl_2O_3S$**
*sym*-Chloride of *o*-sulfobenzoic acid

1279. (308)
B = $C_7H_4Cl_2O_3S$
*asym*-Chloride of *o*-sulfobenzoic acid

| °C | Mol % A |
|---|---|
| A | |
| 75.9 | 100 |
| A + B | |
| 21.4E | 33.5 |
| B | |
| 37.8 | 0 |

**$C_7H_4Cl_2O_3S$**
*sym*-Chloride of *m*-sulfobenzoic acid
1280. *v.* p. 178
B = $C_7H_4Cl_2O_3S$
*sym*-Chloride of *p*-sulfobenzoic acid

*v. also* 704, 705, 1858, 1859

**$C_7H_4Cl_3NO_2$**
*o*-Nitrophenyl-chloroform
*v.* 1867

**$C_7H_4Cl_3NO_2$**
*m*-Nitrophenyl-chloroform
1281. (173)
B = $C_7H_4Cl_3NO_2$
*p*-Nitrophenyl-chloroform

| °C | % A |
|---|---|
| A | |
| 140.8 | 100 |
| 132.1 | 90 |
| A + B | |
| 129.7E | 87.3 |
| B | |
| 148.0 | 80 |
| 168.0 | 70 |
| 183.4 | 60 |
| 196.0 | 50 |
| 206.7 | 40 |
| 216.4 | 30 |
| 224.7 | 20 |
| 232.4 | 10 |
| 240.0 | 0 |

*v. also* 1867

**$C_7H_5Br_3$**
2, 3, 4-Tribromo-toluene
1282. (193)
B = $C_7H_5Br_3$
2, 3, 5-Tribromo-toluene

| °C | Mol % A |
|---|---|
| A | |
| 45 | 100 |
| A + B | |
| 14.0E | 53.3 |
| B | |
| 52.5 | 0 |

1282.1. (193)
B = $C_7H_5Br_3$
2, 3, 6-Tribromotoluene

| °C | Mol % A |
|---|---|
| A | |
| 45 | 100 |
| A + B | |
| 31.5E | 53 |
| B | |
| 60.5 | 0 |

1282.15. (193)
B = $C_7H_5Br_3$
2, 4, 5-Tribromotoluene

| | |
|---|---|
| A | |
| 45.0 | 100 |
| A + B | |
| 31.5E | 73 |
| B | |
| 113.5 | 0 |

1282.2. (193)
B = $C_7H_5Br_3$
2, 4, 6-Tribromotoluene

| | |
|---|---|
| A | |
| 45.0 | 100 |
| A + B | |
| 23.3E | 66 |
| B | |
| 68.5 | 0 |

1282.25. (193)
B = $C_7H_5Br_3$
3, 4, 5-Tribromotoluene

| | |
|---|---|
| A | |
| 45.0 | 100 |
| A + B | |
| 28.5E | 72 |
| B | |
| 90.5 | 0 |

**$C_7H_5Br_3$**
2, 3, 5-Tribromotoluene
1282.3. (193)
B = $C_7H_5Br_3$
2, 3, 6-Tribromotoluene

| | |
|---|---|
| A | |
| 52.5 | 100 |
| A + B | |
| 24.5E | 56 |
| B | |
| 60.5 | 0 |

1282.35. (193)
B = $C_7H_5Br_3$
2, 4, 5-Tribromotoluene

| | |
|---|---|
| A | |
| 52.5 | 100 |
| A + B | |
| 40.0E | 76.5 |
| B | |
| 113.5 | 0 |

1282.4. (193)
B = $C_7H_5Br_3$
2, 4, 6-Tribromotoluene

| °C | Mol % A |
|---|---|
| A | |
| 52.5 | 100 |
| A + B | |
| 71.2?E | 34 |
| B | |
| 68.5 | 0 |

1282.45. (193)
B = $C_7H_5Br_3$
3, 4, 5-Tribromotoluene

| | |
|---|---|
| A | |
| 52.5 | 100 |
| A + B | |
| 41.5E | 80 |
| B | |
| 90.5 | 0 |

*v. also* 1282

**$C_7H_5Br_3$**
2, 3, 6-Tribromotoluene
1282.5. (193)
B = $C_7H_5Br_3$
2, 4, 5-Tribromotoluene

| | |
|---|---|
| A | |
| 60.5 | 100 |
| A + B | |
| 44.5E | 74 |
| B | |
| 113.5 | 0 |

1282.55. (193)
B = $C_7H_5Br_3$
2, 4, 6-Tribromotoluene

| | |
|---|---|
| A | |
| 60.5 | 100 |
| A + B | |
| 33.0E | 55 |
| B | |
| 68.5 | 0 |

1282.6. (193)
B = $C_7H_5Br_3$
3, 4, 5-Tribromotoluene

| | |
|---|---|
| A | |
| 60.5 | 100 |
| A + B | |
| 38.7E | 63 |
| B | |
| 90.5 | 0 |

*v. also* 1282.1, 1282.3

**$C_7H_5Br_3$**
2, 4, 5-Tribromotoluene
1282.65. (193)
B = $C_7H_5Br_3$

1282.65.—(*Cont'd*)
2, 4, 6-Tribromotoluene

| °C | Mol % A |
|---|---|
| A | |
| 113.5 | 100 |
| A + B | |
| 51.5E | 31 |
| B | |
| 68.5 | 0 |

1282.7. (193)
B = $C_7H_5Br_3$
3, 4, 5-Tribromotoluene

| | |
|---|---|
| A | |
| 113.5 | 100 |
| A + B | |
| 62.5E | 40 |
| B | |
| 90.5 | 0 |

*v. also* 1282.15, 1282.35, 1282.5

**$C_7H_5Br_3$**
2, 4, 6-Tribromotoluene
1282.75. (193)
B = $C_7H_5Br_3$
3, 4, 5-Tribromotoluene

| | |
|---|---|
| A | |
| 68.5 | 100 |
| A + B | |
| 61.0E | 77 |
| B | |
| 90.5 | 0 |

*v. also* 1282.2, 1282.4, 1282.55, 1282.65

**$C_7H_5Br_3$**
3, 4, 5-Tribromotoluene
*v.* 1282.25, 1282.45, 1282.6, 1282.7, 1282.75

**$C_7H_5ClO$**
Benzoyl chloride
1283. *v.* p. 178
B = $C_8H_{10}$
*p*-Xylene

1284. *v.* p. 178
B = $C_9H_{12}$
Mesitylene

1285. *v.* p. 178
B = $C_{12}H_{10}$
Diphenyl

1286. *v.* p. 178
B = $C_{13}H_{12}$
Diphenylmethane

*v. also* 825, 857, 969

**$C_7H_5ClO_2$**
*o*-Chlorobenzoic acid
1287. *v.* p. 178
B = $C_7H_5ClO_2$
*m*-Chlorobenzoic acid
*v. also* 1868, 1869

1288. *v.* p. 178
B = $C_7H_5ClO_2$
*p*-Chlorobenzoic acid
*v. also* 1868

1289. *v.* p. 178
B = $C_7H_6O_2$
Benzoic acid
*v. also* 1869

1290. (426)
B = $C_7H_{16}$
Heptane

| °C | Wt. % A |
|---|---|
| 140.3 | 100 |
| 137.5 | 95 |
| 135.0 | 90 |
| 132.0 | 80 |
| 130.0 | 70 |
| 128.7 | 60 |
| 128.0 | 50 |
| 126.5 | 40 |
| 124.3 | 30 |
| 119.0 | 20 |
| 109.5 | 10 |
| 96.5 | 5 |

*v. also* 970, 1868, 1869

**$C_7H_5ClO_2$**
*m*-Chlorobenzoic acid
1291. *v.* p. 178
B = $C_7H_5ClO_2$
*p*-Chlorobenzoic acid
*v. also* 1868

1292. *v.* p. 178
B = $C_7H_6O_2$
Benzoic acid
*v. also* 1869

1293. (426)
B = $C_7H_{16}$
Heptane

| °C | Wt. % A |
|---|---|
| 154.5 | 100 |
| 150.5 | 95 |
| 147.0 | 90 |
| 143.0 | 80 |
| 140.0 | 70 |
| 137.0 | 60 |
| 134.0 | 50 |
| 131.5 | 40 |
| 127.5 | 30 |
| 120.0 | 20 |
| 106.0 | 10 |
| 91.5 | 5 |

*v. also* 971, 1278, 1287, 1868, 1869

**$C_7H_5ClO_2$**
*p*-Chlorobenzoic acid
1294. *v.* p. 178
B = $C_7H_6O_2$
Benzoic acid

1295. (426)
B = $C_7H_{16}$
Heptane

| °C | Wt. % A |
|---|---|
| 241.5 | 100 |
| 238.0 | 95 |
| 235.0 | 90 |
| 229.0 | 80 |
| 224.5 | 70 |
| 221.5 | 60 |
| 218.0 | 50 |
| 213.0 | 40 |
| 206.0 | 30 |
| 196.0 | 20 |
| 180.5 | 10 |
| 160.4 | 5 |

*v. also* 972, 1288, 1291, 1868

**$C_7H_5Cl_2NO_2$**
*o*-Nitrobenzylidene chloride
1296.
B = $C_7H_5Cl_2NO_2$
*m*-Nitrobenzylidene chloride
*v.* 1870

1297.
B = $C_7H_5Cl_2NO_2$
*p*-Nitrobenzylidene chloride
*v.* 1870

**$C_7H_5Cl_2NO_2$**
*m*-Nitrobenzylidene chloride
1298.
B = $C_7H_5Cl_2NO_2$
*p*-Nitrobenzylidene chloride
*v.* 1296, 1870

**$C_7H_5Cl_2NO_4S$**
2-Chloro-5-nitro-*p*-toluenesulfone chloride
1299. (89)
B = $C_7H_5Cl_2NO_4S$
2-Chloro-6-nitro-*p*-toluenesulfone chloride

| °C | % A |
|---|---|
| A | |
| 99.2 | 100 |
| A + B | |
| 50.9E | 36.7 |
| B | |
| 70 | 0 |

**$C_7H_5FO_2$**
*p*-Fluorobenzoic acid
1300. (218)
B = $C_7H_6O_2$
Benzoic acid

| °C | Mol % A |
|---|---|
| Mix. | |
| 182.6 | 100 |
| 176 8 | 90 |
| 170.4 | 80 |
| 163.0 | 70 |
| 160.0U | 66.5 |
| 157.6 | 60 |
| 152.4 | 50 |
| 146.4 | 40 |
| 139.9 | 30 |
| 132.7 | 20 |
| 125.3 | 10 |
| 121.4 | 0 |

**$C_7H_5N$**
Cyanobenzene
*v.* 826

**$C_7H_5NO_3$**
*o*-Nitrobenzaldehyde
*v.* 131, 973

**$C_7H_5NO_3$**
*m*-Nitrobenzaldehyde
*v.* 132, 974, 1049

**$C_7H_5NO_3$**
*p*-Nitrobenz aldehyde
1301. (114)
B = $C_{12}H_{10}$
Acenapthene

| °C | Wt. % A |
|---|---|
| A | |
| 103.2 | 100 |
| A + B | |
| 66.8E | 42 |
| B | |
| 92.5 | 0 |

*v. also* 133, 975

**$C_7H_5NO_4$**
*o*-Nitrobenzoic acid
1302.
B = $C_7H_5NO_4$
*m*-Nitrobenzoic acid
*v.* 1871

1303.
B = $C_7H_5NO_4$
*p*-Nitrobenzoic acid
*v.* 1871

**$C_7H_5NO_4$.—**
(*Continued*)

1304. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| °C | Mol % A |
|---|---|
| A | |
| 147.0 | 100 |
| A + AB | |
| 65.0E | 60 |
| AB | |
| **72.3** | **50** |
| AB + B | |
| 68.0E | 42 |
| B | |
| 132.1 | 0 |

*v. also* 46, 88, 325, 406, 976, 1871

**$C_7H_5NO_4$**
*m*-Nitrobenzoic acid

1305.
B = $C_7H_5NO_4$
*p*-Nitrobenzoic acid
*v.* 1871

1306. (7)
B = $C_7H_6O_2$
Benzoic acid

| °C | Mol % A |
|---|---|
| A | |
| 141.5 | 100 |
| A + AB | |
| 120.0E | 80 |
| AB | |
| **139.0** | **50** |
| AB + B | |
| 109.0E | 12 |
| B | |
| 120.0 | 0 |

*v. also* 47, 89, 326, 407, 977, 1302, 1871

**$C_7H_5NO_4$**
*p*-Nitrobenzoic acid
*v.* 48, 90, 327, 408, 978, 1303, 1305, 1871

**$C_7H_5N_3O_6$**
2, 4, 5-Trinitrotoluene

1307. *v.* p. 178
B = $C_7H_5N_3O_6$
2, 4, 6-Trinitrotoluene

**$C_7H_5N_3O_6$**
2, 4, 6-Trinitrotoluene

1308. (131, 445)
B = $C_7H_5N_3O_8$
Trinitrophenylmethylnitroamine (Tetryl)

1308.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 80.5 | 100 |
| 78.2 | 95 |
| 75.9 | 90 |
| 70.9 | 80 |
| A + $A_2B$ | |
| 67.4E | 73 |
| $A_2B$ | |
| **67.6** | **66.7** |
| $A_2B$ + B | |
| 67.4E | 60 |
| B | |
| 85.0 | 50 |
| 97.0 | 40 |
| 106.8 | 30 |
| 115.2 | 20 |
| 122.5 | 10 |
| 125.8 | 5 |
| 128.72 | 0 |

1309. *v.* p. 178
B = $C_7H_6N_2O_4$
2, 4-Dinitrotoluene
*v. also* 1872

1310. *v.* p. 178
B = $C_7H_6N_2O_4$
2, 6-Dinitrotoluene

1311. (258)
B = $C_7H_6O_2$
*m*-Hydroxybenzaldehyde

| °C | Wt. % A |
|---|---|
| A | |
| 81.0 | 100 |
| A + B | |
| 65.5E | 81 |
| B | |
| 105.0 | 0 |

1312. *v.* p. 178
B = $C_7H_7NO_2$
*o*-Nitrotoluene
*v. also* 1873

1313. *v.* p. 178
B = $C_7H_7NO_2$
*p*-Nitrotoluene
*v. also* 1872, 1873

1314. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| °C | Mol % A |
|---|---|
| A | |
| 80.7 | 100 |
| 78.3 | 95 |
| 75.6 | 90 |
| 72.7 | 85 |
| 69.8 | 80 |
| 66.8 | 75 |
| A + B | |
| 63.0E | 69.5 |
| B | |
| 69.3 | 65 |
| 75.9 | 60 |
| 82.5 | 55 |
| 88.9 | 50 |
| 94.8 | 45 |

1314.—(*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| 100.4 | 40 |
| 105.7 | 35 |
| 110.6 | 30 |
| 115.3 | 25 |
| 119.5 | 20 |
| 123.3 | 15 |
| 126.7 | 10 |
| 132.1 | 0 |

1315. (135)
B = $C_8H_9NO$
*p*-Aminoacetophenone

| °C | Wt. % A |
|---|---|
| A | |
| 80.6 | 100 |
| A + AB | |
| 73.0E | 91 |
| AB | |
| **94.0** | **62.7** |
| AB + B | |
| 85.0E | 40 |
| B | |
| 105.0 | 0 |

1316. (219)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % A |
|---|---|
| A | |
| 81.0 | 100 |
| 75.2 | 90 |
| A + AB | |
| 70.5E | 84.5 |
| AB | |
| 79.0 | 80 |
| 90.5 | 70 |
| 94.8 | 60 |
| **96.5** | **50** |
| 95.2 | 40 |
| 90.0 | 30 |
| 80.1 | 20 |
| AB + B | |
| 72.5E | 14 |
| B | |
| 75.2 | 10 |
| 80.0 | 0 |

1317. (134)
B = $C_{10}H_{16}O$
Camphor

| °C | Wt. % A |
|---|---|
| A | |
| 80.6 | 100 |
| A + B | |
| 52.0E | 57 |
| B | |
| 103.6 | 30 |
| (178.0 | 0) |

1318. (449)
B = $C_{12}H_4N_6O_{12}S$
Picryl sulfide

| | |
|---|---|
| A | |
| 81.5 | 100 |
| 80.5 | 95 |

1318.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A + B | |
| 78.5E | 87.5 |
| B | |
| 99.0 | 80 |
| 122.2 | 70 |
| 145.7 | 60 |
| 163.2 | 50 |
| 176.5 | 40 |
| 187.2d | 30 |

1319. (131)
B = $C_{12}H_5N_7O_{12}$
Hexanitrodiphenylamine

| | |
|---|---|
| A | |
| 80.6 | 100 |
| A + B | |
| 78.2E | 90 |

1320. (265)
B = $C_{12}H_9N$
Carbazole

| | |
|---|---|
| A | |
| 81.5 | 100 |
| A + AB | |
| 75.0E | 95.2 |
| AB | |
| 93.0 | 90 |
| 121.5 | 80 |
| AB + B | |
| 142.0U | 68.5 |
| B | |
| 167.0 | 60 |
| 189.0 | 50 |
| 205.5 | 40 |
| 218.0 | 30 |
| 226.5 | 20 |
| 232.0 | 10 |
| 234.0 | 5 |
| 236.0 | 0 |

1321. (109, 132, 265)
B = $C_{12}H_{10}$
Acenaphthene

| | |
|---|---|
| A | |
| 80.5 | 100 |
| 76.0 | 95 |
| A + AB | |
| 73.0E | 92 |
| AB | |
| 101.0 | 80 |
| 109.5 | 70 |
| **112.0** | **60** |
| 110.0 | 50 |
| 103.5 | 40 |
| 94.5 | 30 |
| AB + B | |
| 81.0E | 18 |
| B | |
| 87.5 | 10 |
| 91.5 | 5 |
| 95.0 | 0 |

The references differ greatly on the acenaphthene side of the system

1322. (132)
B = $C_{12}H_{11}N$
Diphenylamine

| °C | Wt. % A |
|---|---|
| A | |
| 80.6 | 100 |
| A + B | |
| 31.0E | *ca.* 47 |
| B | |
| 52.5 | 0 |

The author believed a compound to be present, due to supercooling in the neighborhood of the eutectic

1323. (137)
B = $C_{12}H_{11}N_3$
*p*-Aminoazobenzene

| | |
|---|---|
| A | |
| 79.5 | 100 |
| A + AB | |
| 67.0E | 81 |
| AB | |
| **81.0** | **53.5** |
| AB + B | |
| 79.0E | 46 |
| B | |
| 122.3 | 0 |

1324. (230)
B = $C_{13}H_{10}$
Fluorene

| | |
|---|---|
| A | |
| 82.0 | 100 |
| 75.9 | 90 |
| A + AB | |
| 71.5E | 83 |
| AB | |
| 83.4 | 70 |
| **85.0** | **57.7** |
| 83.2 | 50 |
| AB + B | |
| 78.5E | 42.5 |
| B | |
| 92.0 | 30 |
| 99.7 | 20 |
| 106.2 | 10 |
| 112.5 | 0 |

1325. (109, 252)
B = $C_{14}H_{10}$
Anthracene

| | |
|---|---|
| A | |
| 82.0 | 100 |
| A + B | |
| 73.0E | 94 |
| B | |
| 86.0 | 90 |
| 112.0 | 80 |
| 134.5 | 70 |
| 153.0 | 60 |
| 169.0 | 50 |
| 182.5 | 40 |
| 192.5 | 30 |
| 200.5 | 20 |

1325.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 207.0 | 10 |
| 210.0 | 5 |
| 212.5 | 0 |

1326. (228)
B = $C_{14}H_{10}$
Phenanthrene

| | |
|---|---|
| A | |
| 80.0 | 100 |
| 77.5 | 95 |
| 74.0 | 90 |
| A + AB | |
| 69.0E | 85 |
| AB | |
| 74.5 | 80 |
| 82.7 | 70 |
| **87.5** | **56** |
| 86.1 | 50 |
| 80.0 | 40 |
| AB + B | |
| 75.5E | 35.8 |
| B | |
| 82.0 | 30 |
| 91.5 | 20 |
| 98.7 | 10 |
| 101.0 | 5 |
| 103.0 | 0 |

1327. (133)
B = $C_{17}H_{14}O$
Cinnamylideneacetophenone

| | |
|---|---|
| A | |
| 80.6 | 100 |
| A + $A_2B$ | |
| 73.3E | 90 |
| $A_2B$ | |
| **87.5** | **66** |
| $A_2B$ + B | |
| 75.0E | 37 |
| B | |
| 100.0 | 0 |

1328. (109)
B = $C_{18}H_{18}$
Retene

| | |
|---|---|
| A | |
| 78.8 | 100 |
| A + AB | |
| 63.9E | 73.2 |
| AB | |
| **78.6** | **49.2** |
| AB + B | |
| 65.4E | 30.7 |
| B | |
| 95.2 | 0 |

1329. (243)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| A | |
| 81.0 | 100 |
| A + B | |
| 76.0E | 92 |
| B | |
| 159.5 | 0 |

*v. also* 564, 594, 636, 714, 738, 1189, 1228, 1241, 1254, 1268.1, 1307, 1872, 1873

**$C_7H_5N_3O_7$**
Trinitroanisole
1330. (449)
B = $C_{12}H_4N_6O_{12}S$
Picryl sulfide

| °C | Wt. % A |
|---|---|
| A | |
| 64.8 | 100 |
| 64.0 | 95 |
| A + B | |
| 62.5E | 87 |
| B | |
| 92.3 | 80 |
| 119.3 | 70 |
| 142.3 | 60 |
| 163.3 | 50 |
| 175.3 | 40 |
| 190.3d | 30? |

**$C_7H_5N_3O_7$**
Trinitrocresol
1331. (411, 412)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % A |
|---|---|
| A | |
| 103 | 100 |
| 93 | 95.3 |
| A + AB | |
| 88.5E | 94.5 |
| AB | |
| 91 | 91.1 |
| 103 | 82.6 |
| 118 | 72.6 |
| 124 | 55.1 |
| **124.5** | **50.0** |
| 124 | 44.1 |
| 120 | 34.5 |
| 113 | 26.0 |
| 105 | 18.4 |
| 93.0 | 11.7 |
| AB + B | |
| 76.4E | 5.55 |
| B | |
| 80.0 | 0 |

**$C_7H_5N_5O_8$**
Trinitrophenylmethylnitroamine
(Tetryl)
1332. (131)
B = $C_7H_7NO_2$
*p*-Nitrotoluene

| °C | Wt. % A |
|---|---|
| A + B | |
| 44.4E | 24 |
| B | |
| 53.0 | 0 |

*v. also* 8, 25, 49, 328, 501, 565, 595, 1032, 1036, 1268.2, 1308

**$C_7H_6ClNO$**
*o*-Chloroformanilide
1333. *v.* p. 178
B = $C_7H_6ClNO$
*p*-Chloroformanilide

**$C_7H_6ClNO_2$**
2-Chloro-3-nitrotoluene
1334. *v.* p. 178
B = $C_7H_6ClNO_2$
2-Chloro-4-nitrotoluene

1335. *v.* p. 178
B = $C_7H_6ClNO_2$
2-Chloro-5-nitrotoluene

1336. (479)
B = $C_7H_6ClNO_2$
2-Chloro-6-nitrotoluene

| °C | Mol % A |
|---|---|
| A | |
| 22.1 | 100 |
| A + $A_3B_2$ | |
| 18.0E | 90 |
| $A_3B_2$ | |
| **19.3** | **60** |
| $A_2B_2$ + B | |
| 17.0E | 30 |
| B | |
| 35.3 | 0 |

1337. *v.* p. 179
B = $C_7H_6ClNO_2$
3-Chloro-4-nitrotoluene

1338. *v.* p. 179
B = $C_7H_6ClNO_2$
3-Chloro-6-nitrotoluene

**$C_7H_6ClNO_2$**
2-Chloro-4-nitrotoluene
1339. (479)
B = $C_7H_6ClNO_2$
2-Chloro-5-nitrotoluene

| °C | Mol % A |
|---|---|
| A | |
| 62.3 | 100 |
| A + AB | |
| 32.0E | 53 |
| AB | |
| **32.1** | **50** |
| AB + B | |
| 27.0E | 35 |
| B | |
| 42.9 | 0 |

1340. *v.* p. 179
B = $C_7H_6ClNO_2$
2-Chloro-6-nitrotoluene

*v. also* 1334

**$C_7H_6ClNO_2$**
2-Chloro-5-nitrotoluene
1341. *v.* p. 179
B = $C_7H_6ClNO_2$
2-Chloro-6-nitrotoluene

*v. also* 1335, 1339

**$C_7H_6ClNO_2$**
3-Chloro-4-nitrotoluene
1342. *v.* p. 179
B = $C_7H_6ClNO_2$
3-Chloro-6-nitrotoluene

*v. also* 1337

**$C_7H_6ClNO_2$**
3-Chloro-6-nitrotoluene
*v.* 1338, 1342

**$C_7H_6ClNO_2$**
4-Chloro-2-nitrotoluene
1343. *v.* p. 179
B = $C_7H_6ClNO_2$
4-Chloro-3-nitrotoluene

**$C_7H_6ClNO_2$**
*o*-Nitrobenzyl chloride
1344. (173)
B = $C_7H_6ClNO_2$
*p*-Nitrobenzyl chloride

| °C | % A |
|---|---|
| A | |
| 47.9 | 100 |
| 43.9 | 90 |
| 39.5 | 80 |
| 34.5 | 70 |
| A + B | |
| 31.8E | 64.6 |
| B | |
| 35.5 | 60 |
| 43.5 | 50 |
| 50.7 | 40 |
| 57.1 | 30 |
| 62.7 | 20 |
| 67.6 | 10 |
| 72.4 | 0 |

*v. also* 979, 1874

**$C_7H_6ClNO_2$**
*m*-Nitrobenzyl chloride
*v.* 1874

**$C_7H_6ClNO_2$**
*p*-Nitrobenzyl chloride
*v.* 1344, 1874

**$C_7H_6Cl_2$**
*o*-Chlorobenzyl chloride
1345. (466)
B = $C_7H_6Cl_2$
*p*-Chlorobenzyl chloride

| °C | % A |
|---|---|
| A | |
| −19.4 | 100 |
| A + B | |
| −30.0E | 78 |
| B | |
| +27.9 | 0 |

**$C_7H_6N_2O_3$**
*o*-Nitroformanilide
1346. *v.* p. 179
B = $C_7H_6N_2O_3$
*p*-Nitroformanilide

**$C_7H_6N_2O_4$**
2, 4-Dinitrotoluene
1347. *v.* p. 179
B = $C_7H_6N_2O_4$
2, 6-Dinitrotoluene

1348. (258)
B = $C_7H_6O_2$
*m*-Hydroxybenzaldehyde

| °C | Wt. % A |
|---|---|
| A | |
| 70.5 | 100 |
| A + B | |
| 55.0E | 76 |
| B | |
| 105.0 | 0 |

1349. *v.* p. 179
B = $C_7H_7NO_2$
*o*-Nitrotoluene
*v. also* 1875

1350. *v.* p. 179
B = $C_7H_7NO_2$
*p*-Nitrotoluene
*v. also* 1872, 1875

1351. (244, 256)
B = $C_7H_9N$
*p*-Toluidine

| °C | Wt. % A |
|---|---|
| A | |
| 70.0 | 100 |
| 65.4 | 95 |
| 60.5 | 90 |
| 50.9 | 80 |
| 40.6 | 70 |
| 28.8 | 60 |
| A + B | |
| 15.5E | 50 |
| B | |
| 25.4 | 40 |
| 31.2 | 30 |
| 35.8 | 20 |
| 39.8 | 10 |
| 41.5 | 5 |
| 43.5 | 0 |

1352. (222)
B = $C_{10}H_8$
Naphthalene

| °C | Mol % A |
|---|---|
| A | |
| 71.5 | 100 |
| 65.9 | 90 |
| 59.8 | 80 |
| A + AB | |
| 55.0E | 72.5 |
| AB | |
| 58.9 | 60 |
| **60.1** | **50** |
| 59.0 | 40 |
| AB + B | |
| 57.0E | 32.5 |
| B | |
| 67.7 | 20 |
| 75.0 | 10 |
| 80.1 | 0 |

1353. (237)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 70.0 | 100 |
| 63.2 | 90 |
| A + AB | |
| 53.0E | 77 |
| AB | |
| 57.5 | 70 |
| **62.0** | **56** |
| 60.8 | 50 |
| 54.8 | 40 |
| 44.7 | 30 |
| AB + B | |
| 34.0E | 21.2 |
| B | |
| 41.9 | 10 |
| 48.0 | 0 |

1354. (237)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| A | |
| 70.0 | 100 |
| 63.2 | 90 |
| 55.2 | 80 |
| A + B | |
| 42.0E | 65.5 |
| B | |
| 53.4 | 60 |
| 70.0 | 50 |
| 81.0 | 40 |
| 90.5 | 30 |
| 97.6 | 20 |
| 103.6 | 10 |
| 109.0 | 0 |

1355. (265)
B = $C_{12}H_9N$
Carbazole

| | |
|---|---|
| A | |
| 68.0 | 100 |
| 66.0 | 95 |
| A + B | |
| 62.0E | 89 |

1355.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 106.0 | 80 |
| 135.0 | 70 |
| 158.5 | 60 |
| 179.0 | 50 |
| 197.0 | 40 |
| 212.0 | 30 |
| 222.0 | 20 |
| 230.0 | 10 |
| 233.4 | 5 |
| 236.0 | 0 |

1356. (132, 239)
B = $C_{12}H_{10}$
Acenaphthene

| | |
|---|---|
| A | |
| 71.0 | 100 |
| 67.3 | 95 |
| 63.7 | 90 |
| 57.3 | 80 |
| A + AB | |
| 54.8E | 75 |
| AB | |
| 60.2 | 60 |
| **61.0** | **54.1** |
| AB + B | |
| 60.8E | 49 |
| B | |
| 68.5 | 40 |
| 75.5 | 30 |
| 82.3 | 20 |
| 88.5 | 10 |
| 91.5 | 5 |
| 94.5 | 0 |

1357. (132)
B = $C_{12}H_{11}N$
Diphenylamine

| | |
|---|---|
| A | |
| 71.0 | 100 |
| A + B | |
| 28.2E | 43 |
| B | |
| 52.5 | 0 |

1358. *v.* p. 179
B = $C_{13}H_{10}$
Fluorene

1359. (252)
B = $C_{14}H_{10}$
Anthracene

| | |
|---|---|
| A | |
| 70.5 | 100 |
| 68.0 | 95 |
| A + B | |
| 66.0E | 91 |
| B | |
| 109.5 | 80 |
| 134.5 | 70 |
| 153.0 | 60 |
| 168.0 | 50 |
| 180.0 | 40 |
| 189.7 | 30 |
| 198.2 | 20 |
| 205.6 | 10 |
| 209.2 | 5 |
| 212.5 | 0 |

**$C_7H_6N_2O_4$.—** *(Continued)*

1360. (228)
B = $C_{14}H_{10}$
Phenanthrene

| °C | Wt. % A |
|---|---|
| A | |
| 69.0 | 100 |
| 66.7 | 95 |
| 64.3 | 90 |
| 58.8 | 80 |
| 51.7 | 70 |
| 41.5 | 60 |
| A + B | |
| 37.0E | 55.9 |
| B | |
| 48.5 | 50 |
| 64.8 | 40 |
| 77.5 | 30 |
| 88.0 | 20 |
| 96.6 | 10 |
| 100.4 | 5 |
| 103.5 | 0 |

1361. (243)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| A | |
| 68.5 | 100 |
| A + B | |
| 65.0E | 88 |
| B | |
| 159.5 | 0 |

*v. also* 77, 596, 716, 739, 980, 1191, 1218, 1229, 1242, 1255, 1309, 1872, 1875

**$C_7H_6N_2O_4$**
2, 6-Dinitrotoluene
1362. *v.* p. 179
B = $C_7H_7NO_2$
*p*-Nitrotoluene

1363. (244)
B = $C_7H_9N$
*p*-Toluidine

| | |
|---|---|
| A | |
| 63.5 | 100 |
| A + B | |
| 18.0E | 45 |
| B | |
| 44.0 | 0 |

1364. (244)
B = $C_{10}H_9N$
α-Naphthylamine

| | |
|---|---|
| A | |
| 63.5 | 100 |
| A + B | |
| 7.5E | 38 |
| B | |
| 49.0 | 0 |

1365. (244)
B = $C_{10}H_9N$
β-Naphthylamine

1365.—*(Continued)*

| °C | Wt. % A |
|---|---|
| A | |
| 63.5 | 100 |
| A + B | |
| 45.0E | 76 |
| B | |
| 110.0 | 0 |

1366. (244)
B = $C_{12}H_{10}$
Acenaphthene

| | |
|---|---|
| A | |
| 63.5 | 100 |
| A + B | |
| 46.0E | 73 |
| B | |
| 94.0 | 0 |

1367. (244)
B = $C_{13}H_{10}$
Fluorene

| | |
|---|---|
| A | |
| 63.6 | 100 |
| A + B | |
| 46.0E | 70 |
| B | |
| 112.5 | 0 |

1368. (244)
B = $C_{14}H_{10}$
Anthracene

| | |
|---|---|
| A | |
| 63.5 | 100 |
| A + B | |
| 54.0E | 94 |
| B | |
| 212.5 | 0 |

1369. (228)
B = $C_{14}H_{10}$
Phenanthrene

| °C | Mol % A |
|---|---|
| A | |
| 65.0 | 100 |
| A + B | |
| 40.0E | 63.5 |
| B | |
| 103.5 | 0 |

*v. also* 981, 1192, 1310, 1347

**$C_7H_6N_2O_4$**
3, 4-Dinitrotoluene
1370. (244)
B = $C_7H_9N$
*p*-Toluidine

| °C | Wt. % A |
|---|---|
| A | |
| 58.5 | 100 |
| A + B | |
| 11.3E | 59 |
| B | |
| 44.0 | 0 |

1371. (244)
B = $C_{10}H_9N$
α-Naphthylamine

1371.—*(Continued)*

| °C | Wt. % A |
|---|---|
| A + B | |
| −10.0E | 46 |
| B | |
| +47.8 | 0 |

1372. (244)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| A | |
| 58.5 | 100 |
| A + B | |
| 33.0E | 72 |
| B | |
| 109.4 | 0 |

1373. (244)
B = $C_{12}H_{10}$
Acenaphthene

| | |
|---|---|
| A | |
| 58.5 | 100 |
| A + B | |
| 39.0E | 70 |
| B | |
| 94.0 | 0 |

1374. (244)
B = $C_{13}H_{10}$
Fluorene

| | |
|---|---|
| A | |
| 58.5 | 100 |
| A + B | |
| 37.2E | 71 |
| B | |
| 112.0 | 0 |

1375. (244)
B = $C_{14}H_{10}$
Anthracene

| | |
|---|---|
| A | |
| 58.5 | 100 |
| A + B | |
| 55.0E | 98 |
| B | |
| 212.0 | 0 |

1376. (228)
B = $C_{14}H_{10}$
Phenanthrene

| °C | Mol % A |
|---|---|
| A | |
| 59.0 | 100 |
| A + B | |
| 33.0E | 66 |
| B | |
| 103.5 | 0 |

*v. also* 982, 1193

**$C_7H_6N_2O_4$**
3, 5-Dinitrotoluene
1377. (244)
B = $C_7H_9N$
*p*-Toluidine

| °C | Wt. % A |
|---|---|
| A | |
| 82.0 | 100 |
| A + AB | |
| 25.0U | 50 |
| AB + B | |
| 22.0E | 39 |

1377.—*(Continued)*

| °C | Wt. % A |
|---|---|
| B | |
| 44.0 | 0 |

1378. (244)
B = $C_{10}H_9N$
α-Naphthylamine

| | |
|---|---|
| A | |
| 82.2 | 100 |
| A + AB | |
| 75.0E | 88 |
| AB | |
| **107.8** | **56** |
| AB + B | |
| 40.0E | 13 |
| B | |
| 48.8 | 0 |

1379. (244)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| A | |
| 82.2 | 100 |
| A + AB | |
| 53.0E | 73 |
| AB | |
| 53.0 | 73–60 |
| AB + B | |
| 53.0U | 60 |
| B | |
| 108.4 | 0 |

1380. (244)
B = $C_{12}H_{10}$
Acenaphthene

| | |
|---|---|
| A | |
| 82.3 | 100 |
| A + AB | |
| 72.0E | 85 |
| AB | |
| **94.0** | **54.1** |
| AB + B | |
| 79.0E | 27 |
| B | |
| 94.0 | 0 |

1381. (244)
B = $C_{13}H_{10}$
Fluorene

| | |
|---|---|
| A | |
| 82.3 | 100 |
| A + B | |
| 42.0E | 61 |
| B | |
| 112.2 | 0 |

1382. (244)
B = $C_{14}H_{10}$
Anthracene

| | |
|---|---|
| A | |
| 82.3 | 100 |
| A + B | |
| 76.0E | 86 |
| B | |
| 212.0 | 0 |

*v. also* 1194

**$C_7H_6N_2O_5$**
2, 4-Dinitroanisole

1383. (164)
B = $C_7H_6N_2O_5$
2, 6-Dinitroanisole

| °C | Wt. % A |
|---|---|
| A | |
| 86.0 | 100 |
| 82.0 | 93.73 |
| 78.05 | 88.23 |
| 73.7 | 82.89 |
| 72.7 | 81.02 |
| 67.4 | 74.84 |
| A + B | |
| 61.8E | *ca.* 63.3 |
| B | |
| 117.5 | 0 |

1384. *v.* p. 179
B = $C_8H_8N_2O_5$
2,4-Dinitrophenetole

**$C_7H_6N_2O_5$**
2, 6-Dinitroanisole
*v.* 1383

**$C_7H_6O$**
Benzaldehyde, *v.* 134

**$C_7H_6O_2$**
*o*-Hydroxy-benzaldehyde
*v.* 136, 982.1

**$C_7H_6O_2$**
*m*-Hydroxy-benzaldehyde
1385. *v.* p. 179
B = $C_7H_6O_2$
Benzoic acid

1386. *v.* p. 179
B = $C_7H_6O_3$
Salicylic acid

1387. *v.* p. 179
B = $C_{10}H_8O$
α-Naphthol

1388. *v.* p. 179
B = $C_{10}H_8O$
β-Naphthol

*v. also* 137, 597, 717, 740, 760, 778, 877, 930, 982.2, 1050, 1091, 1117, 1144, 1170, 1311, 1348

**$C_7H_6O_2$**
*p*-Hydroxy-benzaldehyde
1389. (292)
B = $C_8H_{11}N$
Dimethylaniline

| | |
|---|---|
| A | |
| +115.0 | 100 |
| A + B | |
| − 3.0E | 3 |
| B | |
| + 2.0 | 0 |

*v. also* 138, 982.3, 1051

**$C_7H_6O_2$**
Benzoic acid
1390. (195)
B = $C_7H_6O_3$
Salicylic acid

1391. (255)
B = $C_7H_7NO$
Benzamide

| °C | Wt. % A |
|---|---|
| A | |
| 121.0 | 100 |
| 114.8 | 90 |
| 108.1 | 80 |
| 100.3 | 70 |
| A + $A_xB_y$ | |
| 85.5U | 56 |
| $A_xB_y$ + B | |
| 78.0E | 46.5 |
| B | |
| 86.1 | 40 |
| 98.0 | 30 |
| 108.2 | 20 |
| 116.5 | 10 |
| 120.3 | 5 |
| 124.0 | 0 |

1392. (76.5, 344)
B = $C_7H_8$
Toluene

| | |
|---|---|
| 121.7 | 100 |
| 112.6 | 90 |
| 104.1 | 80 |
| 95.8 | 70 |
| 87.8 | 60 |
| 79.4 | 50 |
| 70.2 | 40 |
| 59.8 | 30 |
| 46.6 | 20 |
| 26.0 | 10 |
| 6.0 | 5 |

1393. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| °C | Mol % A |
|---|---|
| A | |
| 121.0 | 100 |
| 117.2 | 95 |
| 113.1 | 90 |
| 108.6 | 85 |
| 103.2 | 80 |
| 95.9 | 75 |
| 87.2 | 70 |
| 75.7 | 65 |
| 59.6 | 60 |
| A + AB | |
| 48.0E | 57 |
| AB | |
| **50.5** | **50** |
| AB + B | |
| 50.3E | 48.5 |
| B | |
| 70.8 | 45 |
| 84.9 | 40 |
| 95.8 | 35 |

1393.—(*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| 105.2 | 30 |
| 112.9 | 25 |
| 119.0 | 20 |
| 123.6 | 15 |
| 127.2 | 10 |
| 132.1 | 0 |

1394. [8, 12]
B = $C_7H_9N$
*o*-Toluidine

| A | |
|---|---|
| 121.4 | 100 |
| 113.5 | 90 |
| 105.2 | 80 |
| 95.7 | 70 |
| 84.6 | 60 |
| 70.5 | 50 |
| 53.3 | 40 |
| 30.3 | 30 |
| A + AB | |
| + 6.0U | 23 |
| AB | |
| −19.5 | 10 |
| AB + B | |
| −31.5E | 4.5 |
| B | |
| −24.3 | 0 |

1395. [8, 12]
B = $C_7H_9N$
*p*-Toluidine

| A | |
|---|---|
| 121.4 | 100 |
| 113.2 | 90 |
| 104.0 | 80 |
| 90.5 | 70 |
| 72.0 | 60 |
| A + AB | |
| 52.4E | 51.7 |
| AB | |
| **52.5** | **50** |
| 50.7 | 45 |
| 46.6 | 40 |
| AB + B | |
| 28.0E | 30 |
| B | |
| 33.3 | 20 |
| 38.4 | 10 |
| 43.5 | 0 |

1396. *v.* p. 179
B = $C_8H_6O_3$
Piperonal

1397. *v.* p. 179
B = $C_8H_8O$
Acetophenone

1398. [209]
B = $C_8H_8O_2$
Phenylacetic acid

| A | |
|---|---|
| 121.4 | 100 |
| 114.3 | 90 |
| 106.7 | 80 |
| 98.0 | 70 |

1398.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 87.8 | 60 |
| 75.5 | 50 |
| 60.1 | 40 |
| A + B | |
| 52.0E | 35 |
| B | |
| 55.6 | 30 |
| 63.0 | 20 |
| 70.2 | 10 |
| 76.7 | 0 |

1399. [11]
B = $C_9H_7N$
Quinoline

| A | |
|---|---|
| 121.4 | 100 |
| A + AB | |
| +23.0E | 50 |
| AB | |
| **23.0** | **50** |
| AB + B | |
| −40.6E | 17 |
| B | |
| −22.0 | 0 |

1400. *v.* p. 179
B = $C_9H_8O_2$
Cinnamic acid

1401. *v.* p. 179
B = $C_{10}H_8$
Naphthalene

1402. [11]
B = $C_{10}H_9N$
α-Naphthylamine

| A | |
|---|---|
| 121.4 | 100 |
| A + B | |
| 34.0 | 25 |
| B | |
| 48.2 | 0 |

1403. [11]
B = $C_{10}H_9N$
β-Naphthylamine

| A | |
|---|---|
| 121.4 | 100 |
| A + B | |
| 78.7E | 50 |
| B | |
| 111.5 | 0 |

1404. [100, 204]
B = $C_{10}H_{16}O$
Camphor

| A | |
|---|---|
| 121.4 | 100 |
| A + B | |
| 56.5E | 37.5 |
| B | |
| 178.0 | 0 |

1405. [248]
B = $C_{11}H_{12}N_2O$
Antipyrine

| °C | Wt. % A |
|---|---|
| A | |
| 121.0 | 100 |

1405.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A + AB | |
| 59.5E | 49.5 |
| AB | |
| **66.0** | **39.3** |
| AB + B | |
| 59.5E | 31.7 |
| B | |
| 109.1 | 0 |

1406. [11]
B = $C_{12}H_{11}N$
Diphenylamine

| °C | Mol % A |
|---|---|
| A | |
| 121.4 | 100 |
| A + B | |
| 50.6E | 8 |
| B | |
| 53.2 | 0 |

1407. *v.* p. 179
B = $C_{14}H_{10}O_2$
Benzil

*v. also* 9, 91, 113, 135, 177, 195, 279, 303, 329, 379, 409, 501.1, 511, 858, 983, 1190, 1289, 1292, 1294, 1300, 1306, 1385, 1869

**$C_7H_6O_3$**
Salicylic acid
1408. [231]
B = $C_7H_7NO$
Benzamide

| °C | Wt. % A |
|---|---|
| A | |
| 157.0 | 100 |
| A + AB | |
| 114.8E | 64 |
| AB | |
| **116.0** | **53.3** |
| AB + $AB_2$ | |
| 108.5E | 36.5 |
| $AB_2$ | |
| **108.5** | **36.3** |
| $AB_2$ + B | |
| 106.0E | 24 |
| B | |
| 124.8 | 0 |

1409. [208]
B = $C_7H_8O_2$
Dimethylpyrone

| °C | Mol % A |
|---|---|
| A | |
| 158.9 | 100 |
| 155.8 | 95 |
| 152.3 | 90 |
| 147.3 | 85 |
| 140.8 | 80 |
| 132.7 | 75 |
| 122.3 | 70 |
| 109.3 | 65 |
| 89.1 | 60 |

1409.—(*Continued*)

| °C | Mol % A |
|---|---|
| A + AB | |
| 68.0E | 56.5 |
| AB | |
| **71.9** | **50** |
| 69.8 | 45 |
| AB + B | |
| 68.0E | 42.5 |
| B | |
| 93.4 | 35 |
| 105.7 | 30 |
| 114.4 | 25 |
| 120.1 | 20 |
| 124.6 | 15 |
| 127.9 | 10 |
| 132.1 | 0 |

1410. [100]
B = $C_{10}H_{16}O$
Camphor

| A | |
|---|---|
| 156.2 | 100 |
| A + B | |
| 55.0E | 33.5 |
| B | |
| 178.0 | 0 |

1411. [36]
B = $C_{10}H_{18}O$
Cineole

| °C | Wt. % A |
|---|---|
| A | |
| 157.0 | 100 |
| A + B | |
| −11.0E | 20.5 |
| B | |
| + 1.0 | 0 |

1412. [238]
B = $C_{11}H_{12}N_2O$
Antipyrine

| A | |
|---|---|
| 155.0 | 100 |
| A + AB | |
| 72.0E | 54.5 |
| AB | |
| **89.0** | **43.2** |
| AB + B | |
| 72.0E | 26.5 |
| B | |
| 109.8 | 0 |

*v. also* 92, 304, 331, 365, 379.1, 410, 467.1, 985, 1386, 1390

**$C_7H_6O_3$**
*m*-Hydroxybenzoic acid
1413. [231]
B = $C_7H_7NO$
Benzamide

| A | |
|---|---|
| 193.0 | 100 |
| A + AB | |
| 81.4U | 38 |
| AB + B | |
| 79.3E | 35 |

1413.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 124.8 | 0 |

1414. [36]
B = $C_{10}H_{18}O$
Cineole

| A | |
|---|---|
| 200.0 | 100 |
| A + B | |
| −13.0E | 20 |
| B | |
| + 1.0 | 0 |

*v. also* 332, 987

**$C_7H_6O_3$**
*p*-Hydroxybenzoic acid
1415. [231]
B = $C_7H_7NO$
Benzamide

| A | |
|---|---|
| (210.0 | 100) |
| A + $AB_3$ | |
| 74.9E | 39 |
| $AB_3$ + B | |
| 79.8U | 30 |
| B | |
| 124.8 | 0 |

1416. [36]
B = $C_{10}H_{18}O$
Cineole

| A | |
|---|---|
| 214.0 | 100 |
| A + AB | |
| 60.0U | 20 |
| AB + B | |
| −8.0E | 3 |
| B | |
| +1.0 | 0 |

*v. also* 333, 989

**$C_7H_7Br$**
*o*-Bromotoluene
1417. *v.* p. 179
B = $C_7H_7Br$
*p*-Bromotoluene

**$C_7H_7Br$**
*p*-Bromotoluene
1418. [375]
B = $C_8H_{10}$
*p*-Xylene

| A | |
|---|---|
| 26.74 | 100 |
| 24.8 | 95 |
| 22.7 | 90 |
| 18.2 | 80 |
| A + $A_xB_y$ | |
| 12.0U | 70 |
| $A_xB_y$ | |
| 9.4 | 60 |
| 6.1 | 50 |
| $A_xB_y$ + B | |
| 2.39E | 39.22 |

1418.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 4.9 | 30 |
| 7.7 | 20 |
| 10.5 | 10 |
| 12.0 | 5 |
| 13.35 | 0 |

1419. [375]
B = $C_8H_{10}O_2$
Veratrole

| A | |
|---|---|
| +26.74 | 100 |
| A + B | |
| − 3.33E | 52.6 |
| B | |
| +22.22 | 0 |

1420. [375]
B = $C_{10}H_{14}O$
Thymol

| A | |
|---|---|
| 26.74 | 100 |
| 24.15 | 95 |
| 21.8 | 90 |
| 17.8 | 80 |
| 14.2 | 70 |
| A + B | |
| 11.35E | 64.5 |
| B | |
| 22.7 | 50 |
| 28.8 | 40 |
| 34.2 | 30 |
| 39.5 | 20 |
| 44.5 | 10 |
| 46.8 | 5 |
| 49.2 | 0 |

1421. [375]
B = $C_{21}H_{21}N$
Tribenzylamine

| A | |
|---|---|
| +26.73 | 100 |
| A + B | |
| −14.19E | 69.03 |
| B | |
| +91.3 | 0 |

*v. also* 249, 487, 681, 991, 1052, 1267, 1417

**$C_7H_7Cl$**
*o*-Chlorotoluene
1422. *v.* p. 179
B = $C_7H_7Cl$
*p*-Chlorotoluene

**$C_7H_7Cl$**
Benzyl chloride
1423. [482]
B = $C_7H_8O$
Anisole

| °C | Mol % A |
|---|---|
| A | |
| −41.1 | 100 |
| −55.3 | 76.3 |
| −63.0 | 67.0 |
| −70.7 | 52.4 |

**$C_7H_7Cl$.—**
*(Continued)*

1423.—*(Continued)*

| °C | Mol % A |
|---|---|
| A + B | |
| −72.8E | 50 |
| B | |
| −70.5 | 47.2 |
| −59.8 | 34.0 |
| −46.2 | 16.4 |
| −37.2 | 0 |

1424. (482)
B = $C_7H_9N$
Methylaniline

**$C_7H_7ClN_2O_2$**
6-Chloro-4-nitro-*m*-toluidine
1425. (343)
B = $C_7H_7ClN_2O_2$
6-Chloro-3-nitro-*p*-toluidine
Mix.

| | |
|---|---|
| 158.5 | 100 |
| 139.0† | 40 |
| 164.5 | 0 |

**$C_7H_7ClO_2S$**
*o*-Toluenesulfone chloride
1426. *v.* p. 179
B = $C_7H_7ClO_2S$
*p*-Toluenesulfone chloride

**$C_7H_7NO$**
*α*-Benzaldoxime
1427. (67)
B = $C_7H_7NO$
*β*-Benzaldoxime

| °C | % A |
|---|---|
| A | |
| 34.5 | 100 |
| 30.0 | 96.0 |
| 28.6 | 95.0 |
| 26.2 | 91.7 |
| A + B | |
| 25.5E | 91.0 |
| B | |
| 46.0 | 73.7 |
| 79.0 | 49.2 |
| 101.0 | 26.2 |
| 131.0 | 0.0 |

*α* + *β* in stable equil. at 27.7° and 94% *α*

**$C_7H_7NO$**
Benzamide
1428. (269)
B = $C_8H_{10}N_2O$
Nitrosodimethyl-aniline

| °C | Wt. % A |
|---|---|
| A | |
| 121.5 | 100.0 |

1428.—*(Continued)*

| °C | Wt. % A |
|---|---|
| A + $AB_2$ | |
| 65.0E | 30 |
| $AB_2$ | |
| **65.0** | **26.4** |
| $AB_2$ + B | |
| 65.0E | 23 |
| B | |
| 84.5 | 0 |

1429. (231)
B = $C_{10}H_8O$
*α*-Naphthol

| | |
|---|---|
| A | |
| 124.8 | 100 |
| A + B | |
| 38.3E | 41 |
| B | |
| 92.0 | 0 |

1430. (231)
B = $C_{10}H_8O$
*β*-Naphthol

| | |
|---|---|
| A | |
| 124.8 | 100 |
| A + B | |
| 54.3E | 40 |
| B | |
| 122.0 | 0 |

1431. (240)
B = $C_{10}H_8O_2$
1, 4-Dihydroxy-naphthalene

| | |
|---|---|
| A | |
| 128.0 | 100 |
| A + B | |
| 91.0E | 61.5 |
| B | |
| 183.0 | 0 |

1432. (240)
B = $C_{10}H_8O_2$
1, 5-Dihydroxy-naphthalene

| | |
|---|---|
| A | |
| 128.0 | 100 |
| A + B | |
| 106.0E | 72 |
| B | |
| 250.0 | 0 |

1433. (240)
B = $C_{10}H_8O_2$
1, 6-Dihydroxy-naphthalene

| | |
|---|---|
| A | |
| 128.0 | 100 |
| A + B | |
| 90.0E | 45 |
| B | |
| 135.0 | 0 |

1434. (240)
B = $C_{10}H_8O_2$
1, 8-Dihydroxy-naphthalene

| | |
|---|---|
| A | |
| 128.0 | 100 |

1434.—*(Continued)*

| °C | Wt. % A |
|---|---|
| A + B | |
| 46.0E | 46 |
| B | |
| 137.0 | 0 |

1435. (240)
B = $C_{10}H_8O_2$
2, 3-Dihydroxy-naphthalene

| | |
|---|---|
| A | |
| 128.0 | 100 |
| A + $A_2B$ | |
| 106.0E | 75 |
| $A_2B$ | |
| **113.0** | **69.4** |
| $A_2B$ + B | |
| 80.0E | 48 |
| B | |
| 162.0 | 0 |

1436. (240)
B = $C_{10}H_8O_2$
2, 6-Dihydroxy-naphthalene

| | |
|---|---|
| A | |
| 128.0 | 100 |
| A + B | |
| 87.0E | 48 |
| B | |
| 216.0 | 0 |

1437. (240)
B = $C_{10}H_8O_2$
2, 7-Dihydroxy-naphthalene

| | |
|---|---|
| A | |
| 128.0 | 100 |
| A + B | |
| 78.0E | 52 |
| B | |
| 186.0 | 0 |

1438. (255)
B = $C_{14}H_{10}O_3$
Benzoic anhydride

| °C | Mol % A |
|---|---|
| A | |
| 126.5 | 100 |
| 121.0 | 90 |
| 114.0 | 80 |
| 108.0 | 70 |
| 102.0 | 60 |
| 93.0 | 50 |
| 86.0 | 40 |
| 77.0 | 30 |
| 65.0 | 20 |
| A + B | |
| 37.0E | 8 |
| B | |
| 42.0 | 0 |

*v. also* 280, 334, 458, 878, 906, 931, 1053, 1092, 1118, 1145, 1171, 1391, 1408, 1413, 1415

**$C_7H_7NO_2$**
*o*-Nitrotoluene
1439. *v.* p. 179
B = $C_7H_7NO_2$
*m*-Nitrotoluene
*v. also* 1876

1440. *v.* p. 179
B = $C_7H_7NO_2$
*p*-Nitrotoluene

*v. also* 859, 1312, 1349, 1873, 1875, 1876

**$C_7H_7NO_2$**
*m*-Nitrotoluene
1441. *v.* p. 179
B = $C_7H_7NO_2$
*p*-Nitrotoluene
*v. also* 1876

1442. (413)
B = $C_{12}H_{18}O_8$
Diethyl diacetyl-tartrate

| °C | Mol % A |
|---|---|
| A | |
| 16.1 | 100.0 |
| 14.0 | 95.55 |
| A + B | |
| 9.85E | 86.2 |
| B | |
| 20.2 | 75.96 |
| 27.9 | 69.07 |
| 33.6 | 62.36 |
| 38.2 | 54.82 |
| 42.0 | 47.24 |
| 44.35 | 41.73 |
| 47.9 | 34.14 |
| 53.5 | 22.24 |
| 57.2 | 15.06 |
| 63.7 | 4.85 |
| 67.0 | 0.0 |

*v. also* 1439, 1876

**$C_7H_7NO_2$**
*p*-Nitrotoluene
1443. *v.* p. 179
B = $C_{10}H_8$
Naphthalene

1444. (130)
B = $C_{12}H_{11}N$
Diphenylamine

| °C | Wt. % A |
|---|---|
| A | |
| 53.0 | 100 |
| A + B | |
| 18.5E | 49 |
| B | |
| 52.5 | 0 |

*v. also* 394, 741, 860, 1195, 1313, 1332, 1350, 1362, 1440, 1441, 1872, 1873, 1875, 1876

**$C_7H_7NO_3$**
*p*-Nitroanisole
1445. *v.* p. 179
B = $C_{12}H_{11}N$
Diphenylamine

*v. also* 395

**$C_7H_8$**
Toluene
1446. *v.* p. 179
B = $C_{10}H_8$
Naphthalene

1447. (475)
B = $C_{12}H_9N$
Carbazole

| °C | g B per 100 g A |
|---|---|
| 10.0 | 0.51 |
| 20.0 | 0.63 |
| 30.0 | 0.85 |
| 40.0 | 1.17 |
| 50.0 | 1.60 |
| 60.0 | 2.10 |
| 70.0 | 2.75 |
| 80.0 | 3.57 |
| 100.0 | 6.1 |

1448. *v.* p. 179
B = $C_{12}H_{10}$
Acenaphthene

1449. *v.* p. 179
B = $C_{13}H_{10}$
Fluorene

1450. *v.* p. 179
B = $C_{14}H_8O_2$
Anthraquinone

1451. *v.* p. 179
B = $C_{14}H_{10}$
Anthracene

1452. *v.* p. 179
B = $C_{14}H_{10}$
Phenanthrene

*v. also* 34, 233, 250, 396, 682, 879, 907, 932, 992, 1392

**$C_7H_8O$**
*o*-Cresol
1453. (90, 118)
B = $C_7H_8O$
*m*-Cresol

| °C | Mol % A |
|---|---|
| A | |
| 30.45 | 100 |
| 28.3 | 95 |
| 25.9 | 90 |
| 20.8 | 80 |
| 15.3 | 70 |
| A + $A_2B$ | |
| 8.5U | 58.5 |
| $A_2B$ | |
| 8.0 | 50 |
| 7.0 | 40 |
| 5.4 | 30 |
| $A_2B$ + B | |
| 1.5E | 16.5 |

1453.—*(Continued)*

| °C | Mol % A |
|---|---|
| B | |
| 4.9 | 10 |
| 7.5 | 5 |
| 10.0 | 0 |

1454. (90, 118)
B = $C_7H_8O$
*p*-Cresol

| | |
|---|---|
| A | |
| 30.45 | 100 |
| 28.0 | 95 |
| 25.3 | 90 |
| 19.5 | 80 |
| 13.1 | 70 |
| 6.0 | 60 |
| A + $AB_2$ | |
| 2.4E | 55.5 |
| $AB_2$ | |
| 5.8 | 50 |
| 8.2 | 40 |
| **8.7** | **33.3** |
| $AB_2$ + B | |
| 8.7E | 33.3 |
| B | |
| 19.9 | 20 |
| 27.4 | 10 |
| 30.8 | 5 |
| 34.15 | 0 |
| (158.1) | |
| A | |
| 30.08 | 100 |
| 27.7 | 95 |
| 24.8 | 90 |
| 18.0 | 80 |
| 10.1 | 70 |
| A + AB | |
| 0.0E | 59 |
| AB | |
| 6.0 | 55 |
| *ca.* **7.8** | **50** |
| 7.6 | 45 |
| 6.5 | 40 |
| AB + B | |
| 1.57 | 36 |
| B | |
| 9.6 | 30 |
| 19.1 | 20 |
| 27.7 | 10 |
| 34.8 | 0 |

1455. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| | |
|---|---|
| A | |
| 30.3 | 100 |
| 27.4 | 95 |
| 22.3 | 90 |
| A + $A_2B$ | |
| 17.0E | 86 |
| $A_2B$ | |
| 36.0 | 80 |
| 44.8 | 75 |
| 49.5 | 70 |
| **50.4** | **66.7** |

1455.—(*Continued*)

| °C | Mol % A |
|---|---|
| $A_2B$ + AB | |
| 46.0E | 61.5 |
| AB | |
| 52.9 | 55 |
| **54.4** | **50** |
| AB + B | |
| 54.3E | 49 |
| B | |
| 73.9 | 45 |
| 87.8 | 40 |
| 98.3 | 35 |
| 106.5 | 30 |
| 113.5 | 25 |
| 119.5 | 20 |
| 123.6 | 15 |
| 127.0 | 10 |
| 132.1 | 0 |

*v. also* 78, 139, 196, 221, 512, 598, 1054, 1196

## $C_7H_8O$
*m*-Cresol

1456. (90, 118)
B = $C_7H_8O$
*p*-Cresol

| A | |
|---|---|
| 10.0 | 100 |
| 6.7 | 95 |
| A + $A_2B$ | |
| 3.0E | 89 |
| $A_2B$ | |
| 6.8 | 80 |
| **9.6** | **66.7** |
| 9.1 | 60 |
| 6.7 | 50 |
| $A_2B$ + B | |
| 2.5E | 41.5 |
| B | |
| 12.3 | 30 |
| 20.2 | 20 |
| 27.6 | 10 |
| 31.0 | 5 |
| 34.15 | 0 |

*v. also* 1863

1457. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| A | |
|---|---|
| 10.9 | 100 |
| + 5.9 | 95 |
| − 2.0 | 90 |
| A + $A_2B$ | |
| − 9.0E | 86.5 |
| $A_2B$ | |
| +12.2 | 80 |
| 20.2 | 75 |
| 24 6 | 70 |
| **25.4** | **66.7** |
| 22.7 | 60 |
| $A_2B$ + B | |
| 20.0E | 56.8 |

1457.—(*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| 55.7 | 50 |
| 74.4 | 45 |
| 87.8 | 40 |
| 97.7 | 35 |
| 106.3 | 30 |
| 112.9 | 25 |
| 118.4 | 20 |
| 123.0 | 15 |
| 126.7 | 10 |
| 132.1 | 0 |

*v. also* 79, 140, 197, 222, 513, 599, 1055, 1197, 1453, 1863

## $C_7H_8O$
*p*-Cresol

1458. (208)
B = $C_7H_8O_2$
Dimethylpyrone

| A | |
|---|---|
| 34.1 | 100 |
| 29.0 | 95 |
| 21.9 | 90 |
| + 8.3 | 85 |
| A + $A_2B$ | |
| *ca.* | |
| −18.0E | 80 |
| $A_2B$ | |
| + 8.4 | 75 |
| 18.6 | 70 |
| **20.3** | **66.7** |
| $A_2B$ + AB | |
| 19.0E | 63 |
| AB + B | |
| 28.0U | 55.5 |
| B | |
| 55.4 | 50 |
| 73.8 | 45 |
| 87.5 | 40 |
| 97.5 | 35 |
| 105.9 | 30 |
| 112.5 | 25 |
| 118.2 | 20 |
| 123.0 | 15 |
| 126.6 | 10 |
| 132.1 | 0 |

*v. also* 80, 141, 198, 223, 514, 600, 1056, 1198, 1454, 1456, 1863

## $C_7H_8O$
Anisole, *v.* 1423

## $C_7H_8O_2$
Dimethylpyrone

1459. (208)
B = $C_8H_8O_2$
*o*-Toluic acid

| A | |
|---|---|
| 132.1 | 100 |
| 125.9 | 90 |
| 122.1 | 85 |

1459.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 116.9 | 80 |
| 110.8 | 75 |
| 103.7 | 70 |
| 95.0 | 65 |
| 84.9 | 60 |
| 72.7 | 55 |
| 58.5 | 50 |
| A + AB | |
| 47.5U | 46.7 |
| AB + B | |
| 46.0E | 43.7 |
| B | |
| 66.9 | 35 |
| 76.5 | 30 |
| 84.2 | 25 |
| 90.2 | 20 |
| 94.9 | 15 |
| 98.7 | 10 |
| 101.3 | 5 |
| 103.4 | 0 |

1460. (208)
B = $C_8H_8O_2$
*m*-Toluic acid

| A | |
|---|---|
| 132.1 | 100 |
| 126.6 | 90 |
| 122.3 | 85 |
| 117.1 | 80 |
| 111.3 | 75 |
| 104.3 | 70 |
| 95.3 | 65 |
| 84.5 | 60 |
| A + AB | |
| 63.8E | 52 |
| AB | |
| **64.1** | **50** |
| 62.8 | 45 |
| AB + B | |
| 58.7E | 37.8 |
| B | |
| 65.7 | 35 |
| 77.2 | 30 |
| 86.7 | 25 |
| 94.0 | 20 |
| 99.2 | 15 |
| 103.0 | 10 |
| 105.7 | 5 |
| 107.6 | 0 |

1461. (208)
B = $C_8H_8O_2$
*p*-Toluic acid

| A | |
|---|---|
| 132.1 | 100 |
| 127.9 | 90 |
| 124.8 | 85 |
| 120.9 | 80 |
| 115.4 | 75 |
| 107.8 | 70 |
| 97.8 | 65 |
| A + AB | |
| 85.0E | 59.5 |
| AB | |
| 87.1 | 55 |

1461.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB + B | |
| 88.0U | 51.5 |
| B | |
| 114.3 | 45 |
| 127.3 | 40 |
| 138.0 | 35 |
| 146.7 | 30 |
| 154.0 | 25 |
| 160.2 | 20 |
| 165.5 | 15 |
| 170.3 | 10 |
| 174.6 | 5 |
| 178.5 | 0 |

1462. (208)
B = $C_8H_8O_2$
Phenylacetic acid

| A | |
|---|---|
| 132.1 | 100 |
| 126.6 | 90 |
| 122.5 | 85 |
| 117.5 | 80 |
| 111.8 | 75 |
| 104.6 | 70 |
| 95.9 | 65 |
| 85.0 | 60 |
| 71.7 | 55 |
| 55.3 | 50 |
| A + AB | |
| 22.5U | 43 |
| AB | |
| 20.8 | 40 |
| 23.2 | 35 |
| AB + B | |
| 15.5E | 37 |
| B | |
| 38.0 | 30 |
| 48.8 | 25 |
| 57.6 | 20 |
| 64.1 | 15 |
| 69.2 | 10 |
| 73.3 | 5 |
| 76.7 | 0 |

1463. (208)
B = $C_8H_8O_3$
Mandelic acid

| A | |
|---|---|
| 132.1 | 100 |
| 124.8 | 90 |
| 120.2 | 85 |
| 114.8 | 80 |
| 108.3 | 75 |
| 100.0 | 70 |
| 88.9 | 65 |
| A + AB | |
| 65.0E | 57.6 |
| AB | |
| 67.2 | 55 |
| **69.3** | **50** |
| AB + $AB_2$ | |
| 67.2E | 44.5 |
| $AB_2$ | |
| 71.2 | 40 |
| **74.0** | **33.3** |

1463.—(*Continued*)

| °C | Mol % A |
|---|---|
| $AB_2$ + B | |
| 73.9E | 32.5 |
| B | |
| 79.5 | 30 |
| 88.9 | 25 |
| 96.7 | 20 |
| 103.0 | 15 |
| 108.6 | 10 |
| 113.4 | 5 |
| 117.0 | 0 |

1464. (208)
B = $C_9H_8O_2$
Cinnamic acid

| A | |
|---|---|
| 132.1 | 100 |
| 126.3 | 90 |
| 122.3 | 85 |
| 117.7 | 80 |
| 111.9 | 75 |
| 105.2 | 70 |
| 96.9 | 65 |
| 86.8 | 60 |
| A + AB | |
| 72.5E | 54.3 |
| AB | |
| **73.2** | **50** |
| AB + B | |
| 72.0E | 42.7 |
| B | |
| 88.2 | 40 |
| 100.2 | 35 |
| 109.8 | 30 |
| 117.0 | 25 |
| 122.7 | 20 |
| 127.2 | 15 |
| 131.0 | 10 |
| 134.2 | 5 |
| 136.8 | 0 |

1465. (208)
B = $C_9H_{10}O_2$
Hydrocinnamic acid

| A | |
|---|---|
| 132.1 | 100 |
| 126.8 | 90 |
| 118.6 | 80 |
| 106.0 | 70 |
| 97.7 | 65 |
| 87.4 | 60 |
| 75.3 | 55 |
| 60.1 | 50 |
| 42.0 | 45 |
| +20.5 | 40 |
| A + B | |
| − 2.0E | 36.5 |
| B | |
| +14.3 | 30 |
| 24.0 | 25 |
| 30.6 | 20 |
| 36.1 | 15 |
| 40.2 | 10 |
| 43.2 | 5 |
| 45.0 | 0 |

1466. (208)
B = $C_{10}H_8O$
*α*-Naphthol

| °C | Mol % A |
|---|---|
| A | |
| 132.1 | 100 |
| 126.6 | 90 |
| 123.2 | 85 |
| 119.0 | 80 |
| 113.0 | 75 |
| 105.5 | 70 |
| 96.8 | 65 |
| 83.5 | 60 |
| A + AB | |
| 65.0E | 55 |
| AB | |
| **69.8** | **50** |
| AB + $A_2B_3$ | |
| 69.8E | 50 |
| $A_2B_3$ | |
| 77.5 | 45 |
| **79.1** | **40** |
| 77.1 | 35 |
| 70.6 | 30 |
| $A_2B_3$ + B | |
| 53.0E | 24 |
| B | |
| 67.2 | 20 |
| 79.4 | 15 |
| 86.6 | 10 |
| 91.8 | 5 |
| 96.1 | 0 |

1467. (208)
B = $C_{10}H_8O$
*β*-Naphthol

| A | |
|---|---|
| 132.1 | 100 |
| 127.5 | 90 |
| 124.0 | 85 |
| 119.2 | 80 |
| 112.7 | 75 |
| 105.2 | 70 |
| 96.5 | 65 |
| 83.3 | 60 |
| 66.1 | 55 |
| A + $A_2B_3$ | |
| 35.0E | 49.5 |
| $A_2B_3$ | |
| 37.8 | 45 |
| $A_2B_3$ + $AB_2$ | |
| 39.5U | 41 |
| $AB_2$ | |
| **44.6** | **33.3** |
| $AB_2$ + B | |
| 44.0E | 31.5 |
| B | |
| 80.0 | 25 |
| 95.3 | 20 |
| 106.0 | 15 |
| 113.2 | 10 |
| 118.0 | 5 |
| 121.6 | 0 |

*v. also* 61, 142, 178, 199, 281, 366, 367, 434, 436, 457, 566,

$C_7H_5O_2$.—(*Cont'd*)
501, 779, 880, 908, 933, 1057, 1304, 1314, 1393, 1409, 1455, 1457, 1458

**$C_7H_8O_2$**
Guaiacol
1468. (395, 396)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Mol % A |
|---|---|
| A | |
| 28.1 | 100 |
| A + AB | |
| 14.3E | 77 |
| AB | |
| **21.4** | **50** |
| AB + B | |
| 19.8E | 40 |
| B | |
| 48.5 | 0 |

1469. (36)
B = $C_{10}H_{18}O$
Cineole

| °C | Wt. % A |
|---|---|
| A | |
| 30.0 | 100 |
| A + AB | |
| 2.5E | 57 |
| AB | |
| **+ 5.0** | **44.5** |
| AB + B | |
| − 5.0E | 23 |
| B | |
| + 1.0 | 0 |

1470. (34)
B = $C_{13}H_{10}O_3$
Salol

| A | |
|---|---|
| 29.0 | 100 |
| 24.5 | 90 |
| 19.0 | 80 |
| 13.5 | 70 |
| 9.0 | 60 |
| A + B | |
| 3.0E | 47 |
| B | |
| 8.0 | 40 |
| 16.5 | 30 |
| 25.0 | 20 |
| 33.0 | 10 |
| 42.0 | 0 |

*v. also* 200, 224, 602

**$C_7H_9N$**
Methylaniline
*v.* 1424

**$C_7H_9N$**
*o*-Toluidine
1471. *v.* p. 179
B = $C_7H_9N$
*p*-Toluidine

1472. (220)
B = $C_8H_{10}N_2O$
Nitrosodimethyl-aniline

| °C | Mol % A |
|---|---|
| $AB_2$ | |
| −17.0 | 94.8 |
| +15.0 | 85.7 |
| **70.0** | **33** |
| $AB_2$ + B | |
| 66.7E | 21.5 |
| B | |
| 86.0 | 0 |

*v. also* 281.1, 1058, 1199, 1394

**$C_7H_9N$**
*m*-Toluidine
1473. *v.* p. 179
B = $C_7H_9N$
*p*-Toluidine

*v. also* 281.2

**$C_7H_9N$**
*p*-Toluidine
1474. (220)
B = $C_8H_{10}N_2O$
Nitrosodimethyl-aniline

| A | |
|---|---|
| 43.0 | 100 |
| A + $AB_2$ | |
| 27.2E | 73.3 |
| $AB_2$ + B | |
| **48.5E** | **33.3** |
| B | |
| 86.0 | 0 |

1475. *v.* p. 180
B = $C_{10}H_8$
Naphthalene

1476. (381, 467)
B = $C_{10}H_8O$
α-Naphthol

| A | |
|---|---|
| 43.1 | 100 |
| A + AB | |
| 30.0E | 81.5 |
| AB | |
| **53.6** | **50** |
| AB + B | |
| 52.0E | 40 |
| B | |
| 93.9 | 0 |

1477. (247, 264, 467)
B = $C_{10}H_8O$
β-Naphthol

| °C | Wt. % A |
|---|---|
| A | |
| 43.5 | 100 |
| A + AB | |
| 38.2E | 89 |
| AB | |
| **81.5** | **42.6** |

1477.—(*Continued*)

| °C | Wt. % A |
|---|---|
| AB + B | |
| 78.0E | 33.5 |
| B | |
| 122.0 | 0 |

1478. (467)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Mol % A |
|---|---|
| A | |
| 45 | 100.0 |
| 23 | 66.67 |
| B | |
| 14 | 50.0 |
| 25 | 33.3 |
| 50 | 0.0 |

1479. (467)
B = $C_{10}H_9N$
β-Naphthylamine

| A | |
|---|---|
| 45 | 100.0 |
| 28 | 66.67 |
| B | |
| 30.0 | 50.0 |
| 43.0 | 33.33 |
| 112 | 0.0 |

1480. (101)
B = $C_{10}H_{16}O$
Camphor

| A | |
|---|---|
| 45 | 100.0 |
| A + AB | |
| **+3.8E** | **50** |
| AB + B | |
| −2.5E | 42 |
| B | |
| 178.0 | 0 |

1481. (379)
B = $C_{10}H_{20}O$
Menthol

| A | |
|---|---|
| 45.0 | 100 |
| 41.2 | 89.22 |
| 33.8 | 72.98 |
| 29.5 | 59.34 |
| 21.7 | 46.26 |
| A + B | |
| 19.5E | 43 |
| B | |
| 20.5 | 41.31 |
| 25.0 | 32.92 |
| 31.0 | 20.73 |
| 38.5 | 7.03 |
| 43.0 | 0.0 |

1482. (467)
B = $C_{12}H_{11}N$
Diphenylamine

| A | |
|---|---|
| 45 | 100 |
| 24.5 | 66.67 |
| B | |
| 29 | 50.0 |
| 35 | 33.3 |
| 54 | 0.0 |

1483. (260)
B = $C_{13}H_{10}O$
Benzophenone

| °C | Wt. % A |
|---|---|
| A | |
| 43.5 | 100 |
| A + B | |
| 6.0E | 36 |
| B | |
| 47.1 | 0 |

1484. (467)
B = $C_{14}H_{10}$
Anthracene

| °C | Mol % A |
|---|---|
| A | |
| 45 | 100 |
| B | |
| 156 | 66.67 |
| 170 | 50.00 |
| 184 | 33.33 |
| 213 | 0.00 |

1485. (254)
B = $C_{19}H_{16}$
Triphenylmethane

| °C | Wt. % A |
|---|---|
| A | |
| 44.0 | 100 |
| A + B | |
| 33.0E | 64 |
| B | |
| 89.2 | 0 |

1486. (271)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| A | |
|---|---|
| 43.0 | 100 |
| A + B | |
| 36.2E | 72 |
| B | |
| 159.2 | 0 |

*v. also* 281.3, 335, 459.81, 488, 718, 742, 761, 881, 909, 934, 1059, 1093, 1119, 1146, 1172, 1201, 1219, 1225, 1351, 1363, 1370, 1377, 1395, 1471, 1473, 1860

**$C_7H_9NO_2S$**
*o*-Toluene-sulfonamide
1487. *v.* p. 180
B = $C_7H_9NO_2S$
*p*-Toluene-sulfonamide

**$C_7H_{16}$**
Heptane
*v.* 1290, 1293, 1295

**$C_7H_{16}O_4S_2$**
Sulfonal
1488. (38)
B = $C_{10}H_8O$

1488.—(*Continued*)
β-Naphthol

| °C | Mol % A |
|---|---|
| A | |
| 124.5 | 100.0 |
| 120.0 | 90.0 |
| 110.0 | 74.0 |
| 100.0 | 64.3 |
| 90.0 | 56.0 |
| 80.0 | 48.7 |
| A + B | |
| 67.0E | 39.0 |
| B | |
| 70.0 | 37.3 |
| 80.0 | 32.0 |
| 90.0 | 26.0 |
| 100.0 | 19.0 |
| 110.0 | 11.0 |
| 122.0 | 0.0 |

*v. also* 1877

1489. (38)
B = $C_{13}H_{10}O_3$
Salol

| A | |
|---|---|
| 124.5 | 100.0 |
| 120 | 85.0 |
| 110 | 60.0 |
| 100 | 43.0 |
| 90 | 31.0 |
| 80 | 24.5 |
| 70 | 20.0 |
| 60 | 16.7 |
| 50 | 13.8 |
| 40 | 11.5 |
| A + B | |
| 34E | 10.0 |
| B | |
| 42.5 | 0.0 |

*v. also* 1877

**$C_8H_4Cl_2O_2$**
*sym*-Phthalyl chloride
1490. *v.* p. 180
B = $C_8H_4Cl_2O_2$
*asym*-Phthalyl chloride

**$C_8H_4O_3$**
Phthalic anhydride
1491. (341)
B = $C_8H_6O_4$
Phthalic acid

| A | |
|---|---|
| 130.84 | 100 |
| A + B | |
| 129.74E | 98.25 |
| B | |
| 146.4 | 95 |
| (*ca.* 208 | 0) |

1492. *v.* p. 180
B = $C_{10}H_8$
Naphthalene

1493. (100)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 128.5 | 100 |
| A + B | |
| 84.7E | 31 |
| B | |
| 178.0 | 0 |

*v. also* 26

**$C_8H_5Br_3O_2$**
Acetyltribromo-phenol, *v.* 541

**$C_8H_5NO_5$**
Nitropiperonal
*v.* 143

**$C_8H_6BrClO_2$**
Phenyl bromo-chloroacetate
1494. (81)
B = $C_8H_6Cl_2O_2$
Phenyl dichloro-acetate
Mix.

| | |
|---|---|
| 43.7 | 100 |
| 46.25 | 0 |

**$C_8H_6O_2$**
Phthalide
1495. (294)
B = $C_{19}H_{17}N_3$
Triphenyl-guanidine

| °C | Wt. % A |
|---|---|
| $A_s$ | |
| 72.8 | 100 |
| $A_m$ | |
| 65.0 | 100 |
| $A_s$ + $B_m$ | |
| 51.5E | 72 |
| $A_m$ + $B_m$ | |
| 49.4E | 70 |
| $A_s$ + $B_s$ | |
| 60.5E | 68 |
| $A_m$ + $B_s$ | |
| 58.0E | 66 |
| $B_m$ | |
| 138.0 | 0 |
| $B_s$ | |
| 142.4 | 0 |

*v. also* 305

**$C_8H_6O_3$**
Piperonal
1496. (114)
B = $C_{12}H_{10}$
Acenaphthene

| A | |
|---|---|
| 80.2 | 100 |
| A + B | |
| 67.5E | 69 |
| B | |
| 92.5 | 0 |

*v. also* 144, 201, 225, 1396

**$C_8H_6O_3$**
*o*-Aldehydobenzoic acid
*v.* 993

**$C_8H_6O_3$**
*m*-Aldehydobenzoic acid
*v.* 994

**$C_8H_6O_3$**
*p*-Aldehydobenzoic acid
*v.* 995

**$C_8H_6O_4$**
*o*-Phthalic acid
*v.* 93, 336, 411, 1491

**$C_8H_7BrClNO$**
2-Bromo-4-chloro-acetanilide
1497. (355)
B = $C_8H_7BrClNO$
4-Bromo-2-chloro-acetanilide

| °C | % A |
|---|---|
| Mix. | |
| 151.4 | 100 |
| 134.6 | 0 |

*v. also* 337

**$C_8H_7BrClNO$**
4-Bromo-2-chloro-acetanilide
1498. (355)
B = $C_8H_7Br_2NO$
2, 4-Dibromo-acetanilide

| °C | % A |
|---|---|
| Mix. | |
| 151.4 | 100 |
| 144.7 | 0 |

1499. (355)
B = $C_8H_7Cl_2NO$
2, 4-Dichloro-acetanilide

| Mix. | |
|---|---|
| 151.4 | 100 |
| 144.1 | 0 |

*v. also* 338, 1497

**$C_8H_7Br_2NO$**
2, 4-Dibromo-acetanilide
*v.* 339, 1498

**$C_8H_7ClN_2O_3$**
4-Nitro-2-chloro-acetanilide
1500. (62)
B = $C_8H_7ClN_2O_3$
6-Nitro-2-chloro-acetanilide

1500.—(*Continued*)

| °C | % A |
|---|---|
| A | |
| 141.9 | 100 |
| A + B | |
| 127.5E | 77.5 |
| B | |
| 192.2 | 0 |

**$C_8H_7ClN_2O_3$**
4-Nitro-3-chloro-acetanilide
1501. (62)
B = $C_8H_7ClN_2O_3$
6-Nitro-3-chloro-acetanilide

| A | |
|---|---|
| 144.0 | 100 |
| A + B | |
| 98.0E | 38 |
| B | |
| 117.4 | 0 |

**$C_8H_7Cl_2NO$**
2, 4-Dichloro-acetanilide
1502. (355)
B = $C_8H_8ClNO$
4-Chloroacetanilide

| °C | Mol % A |
|---|---|
| A | |
| 144.1 | 100 |
| A + B | |
| 127.6E | 61.9 |
| B | |
| 179.0 | 0 |

*v. also* 340, 1499

**$C_8H_7NO_4$**
*o*-Nitrophenyl acetate
*v.* 882

**$C_8H_7N_3O_5$**
2, 4-Dinitro-acetanilide
1504. *v.* p. 180
B = $C_8H_8N_2O_3$
*p*-Nitroacetanilide

**$C_8H_7N_3O_6$**
2, 4, 6-Trinitro-*m*-xylene
*v.* 637, 1268.3

**$C_8H_8BrNO$**
*p*-Bromoacetanilide
*v.* 341

**$C_8H_8ClNO$**
2-Chloroacetanilide
1505. (354.5)
B = $C_8H_8ClNO$
4-Chloroacetanilide

| °C | Wt. % A |
|---|---|
| A | |
| 86.8 | 100 |
| A + B | |
| 77.0E | 14.5 |

1505.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 179.0 | 0 |

*v. also* 996

**$C_8H_8ClNO$**
3-Chloroacetanilide
*v.* 997

**$C_8H_8ClNO$**
4-Chloroacetanilide
*v.* 342, 998, 1502, 1505

**$C_8H_8N_2O_3$**
*o*-Nitroacetanilide
*v.* 999

**$C_8H_8N_2O_3$**
*m*-Nitroacetanilide
*v.* 1000

**$C_8H_8N_2O_3$**
*p*-Nitroacetanilide
*v.* 1001, 1504

**$C_8H_8N_2O_4$**
2, 3-Dinitro-*p*-xylene
1506. (40)
B = $C_8H_8N_2O_4$
2, 6-Dinitro-*p*-xylene

| °C | Mol % A |
|---|---|
| A | |
| 91.6 | 100 |
| A + AB | |
| 81.8E | 83 |
| AB | |
| **96.2** | **50** |
| AB + B | |
| 95.8E | 44 |
| B | |
| 122.0 | 0 |

**$C_8H_8N_2O_5$**
2, 4-Dinitro-phenetole
*v.* 1384

**$C_8H_8O$**
Acetophenone
1507. (249)
B = $C_{10}H_8O$
α-Naphthol

| °C | Wt. % A |
|---|---|
| A | |
| 20.0 | 100 |
| A + AB | |
| 0.0 | 68 |
| AB + B | |
| **13.0U** | **45.5** |
| B | |
| 93.2 | 0 |

1508. (249)
B = $C_{10}H_8O$
β-Naphthol

1508.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 20.0 | 100 |
| A + AB | |
| 2.0E | 68 |
| AB + B | |
| 8.0U | 54 |
| B | |
| 121.5 | 0 |

*v. also* 145, 202, 603, 780, 883, 910, 935, 1002, 1060, 1094, 1120, 1147, 1173, 1397

**$C_8H_8O_2$**
Anisaldehyde
*v.* 146

**$C_8H_8O_2$**
Aldehydohydroxy-methylbenzenes
*v.* 1002.1, 1002.2, 1002.3

**$C_8H_8O_2$**
Phenylacetic acid
1509. *v.* p. 180
B = $C_9H_{10}O_2$
Hydrocinnamic acid

*v. also* 94, 147, 179, 203, 343, 412, 604, 1398, 1462

**$C_8H_8O_2$**
*o*-Toluic acid
*v.* 148, 180, 204, 605, 1459

**$C_8H_8O_2$**
*m*-Toluic acid
*v.* 149, 181, 205, 606, 1460

**$C_8H_8O_2$**
*p*-Toluic acid
*v.* 150, 182, 206, 1461

**$C_8H_8O_2$**
Methyl benzoate
*v.* 151

**$C_8H_8O_3$**
*d*-Mandelic acid
1510. (1, 72)
B = $C_8H_8O_3$
*l*-Mandelic acid

| A | |
|---|---|
| 132.8 | 100 |
| 130.4 | 95 |
| 128.0 | 90 |
| 123.2 | 80 |
| 118.0 | 70 |
| A + AB | |
| 113.0E | 61.5 |

1510.—(*Continued*)

| °C | Wt. % A |
|---|---|
| AB | |
| **118.0** | **50** |
| AB + B | |
| 113.0E | 38.5 |
| B | |
| 118 | 30 |
| 123.2 | 20 |
| 128.0 | 10 |
| 130.4 | 5 |
| 132.8 | 0 |

**$C_8H_8O_3$**
*l*-Mandelic acid
*v.* 427, 1510

**$C_8H_8O_3$**
*dl*-Mandelic acid
*v.* 95, 344, 413, 1463

**$C_8H_8O_3$**
Methyl salicylate
1511. (36)
B = $C_{10}H_{18}O$
Cineole

| A | |
|---|---|
| + 1.0 | 100 |
| A + AB | |
| −41.5E | 78 |
| AB | |
| **−15.0** | **49.7** |
| AB + B | |
| −18.0E | 39 |
| B | |
| + 1.0 | 0 |

**$C_8H_8O_3$**
Vanillin
1512. (114)
B = $C_{12}H_{10}$
Acenaphthene

| °C | Wt. % A |
|---|---|
| A | |
| 80.2 | 100 |
| A + B | |
| 67.5E | 69 |
| B | |
| 92.5 | 0 |

*v. also* 152, 207

**$C_8H_9NO$**
*p*-Amino-acetophenone
*v.* 544, 1315

**$C_8H_9NO$**
Acetanilide
1513. (65)
B = $C_{11}H_{12}N_2O$
Antipyrine

| °C | Mol % A |
|---|---|
| A | |
| 113.5 | 100 |
| 109.0 | 90 |
| 100.0 | 80 |
| 85.0 | 70 |
| 73.7 | 65 |
| 60.0 | 60 |

1513.—(*Continued*)

| °C | Mol % A |
|---|---|
| A + B | |
| 45.0E | 55 |
| B | |
| 58.0 | 50 |
| 68.5 | 45 |
| 78.0 | 40 |
| 85.0 | 35 |
| 90.0 | 30 |
| 99.0 | 20 |
| 107.0 | 10 |
| 113.0 | 0 |

*v. also* 96, 345, 397, 743, 781, 1002.4, 1033, 1061

**$C_8H_9NO_3$**
α-*N*-Acetylbenzoyl-hydroxylamine
1514. (67)
B = $C_8H_9NO_3$
β-*N*-Acetylbenzoyl-hydroxylamine

| A | |
|---|---|
| 99 | 100 |
| A + B | |
| 65.5E | 25 |
| B | |
| 70 | 0 |

A + B in stable equil. at 95° and 93 % A

**$C_8H_{10}$**
*m*-Xylene
*v.* 1029.1, 1033.1, 1036.1, 1121

**$C_8H_{10}$**
*p*-Xylene
1515. (375)
B = $C_8H_{10}O_2$
Veratrole

| °C | Wt. % A |
|---|---|
| A | |
| 13.35 | 100.0 |
| 8.04 | 82.83 |
| 4.03 | 70.03 |
| +1.47 | 62.26 |
| −1.51 | 55.63 |
| A + B | |
| −4.00E | 51.01 |
| B | |
| −1.99 | 42.65 |
| +1.73 | 36.78 |
| 5.85 | 29.19 |
| 10.64 | 20.32 |
| 16.10 | 10.41 |
| 19.87 | 4.10 |
| 22.40 | 0.00 |

1516. *v.* p. 180
B = $C_{13}H_{10}$
Fluorene

## $C_8H_{10}$—
(*Continued*)

*v. also* 251, 282, 424, 428, 489, 1003, 1062, 1268, 1269, 1283, 1418

## $C_8H_{10}N_2$
α-Acetaldehydephenylhydrazone
1517. (420.5)
B = $C_8H_{10}N_2$
β-Acetaldehydephenylhydrazone

| °C | Mol % A |
|---|---|
| Mix. | |
| 98.6 | 100 |
| 56.0 | 0 |

## $C_8H_{10}N_2O$
*p*-Nitrosomonoethylaniline
1518. (201)
B = $C_8H_{10}N_2O_2$
*p*-Nitromonoethylaniline

| | |
|---|---|
| Mix. | |
| 74.1 | 100 |
| 54.0† | 70 |
| 94.0 | 0 |

## $C_8H_{10}N_2O$
Nitrosodimethylaniline
1519. (220)
B = $C_8H_{11}N$
*m*-Xylidine

| | |
|---|---|
| A | |
| 86.0 | 100 |
| A + $A_2B_3$ | |
| 47.0E | 63.3 |
| $A_2B_3$ | |
| **47.8** | **40** |
| $A_2B_3$ + $AB_3$ | |
| 25.3E | 30 |
| $AB_3$ | |
| **26.0** | **25** |

1520. (269)
B = $C_9H_7N$
Quinoline

| °C | Wt. % A |
|---|---|
| +84.5 | 100 |
| −12.0 | 23.8 |

1521. (269)
B = $C_{10}H_9N$
α-Naphthylamine

| | |
|---|---|
| A | |
| 84.5 | 100 |
| A + $A_2B$ | |
| 72.0E | 87.5 |
| $A_2B$ | |
| **84.0** | **67.5** |
| $A_2B$ + B | |
| 30.5E | 12 |
| B | |
| 48.1 | 0 |

1522. (220)
B = $C_{10}H_9N$
β-Naphthylamine

| °C | Mol % A |
|---|---|
| A | |
| 86.0 | 100 |
| A + $A_3B_2$ | |
| 73.5E | 84.5 |
| $A_3B_2$ | |
| **86.2** | **60** |
| $A_3B_2$ + B | |
| 81.8E | 35.5 |
| B | |
| 110.0 | 0 |

1523. (269)
B = $C_{13}H_9N$
Acridine

*v. also* 306, 515, 1063, 1202, 1230, 1243, 1256, 1428, 1472, 1474

## $C_8H_{10}N_2O$
Acetylphenylenediamines
*v.* 1003.1, 1003.2, 1003.3

## $C_8H_{10}N_2O_2$
*p*-Nitromonoethylaniline
*v.* 1518

## $C_8H_{10}N_4O_2$
Caffeine
1524. *v.* p. 180
B = $C_{11}H_{12}N_2O$
Antipyrine

*v. also* 10, 50, 346, 502, 1004

## $C_8H_{10}O_2$
Veratrole
*v.* 1419, 1515

## $C_8H_{11}N$
Dimethylaniline
1525. *v.* p. 180
B = $C_{13}H_{12}O$
Benznydrol

1526. *v.* p. 180
B = $C_{17}H_{20}N_2O$
Tetramethyldiaminobenzophenone

*v. also* 282.1, 837, 1064, 1389

## $C_8H_{11}N$
*m*-Xylidine
*v.* 1065, 1203, 1519

## $C_8H_{14}O_4$
Diethyl succinate
*v.* 153

## $C_8H_{18}O$
Octyl alcohol, *v.* 81

## $C_9H_6O_2$
Coumarin
*v.* 567

## $C_9H_7BrO$
α-Bromocinnamic aldehyde
1527. (288)
B = $C_9H_7ClO$
α-Chlorocinnamic aldehyde

| °C | Mol % A |
|---|---|
| Mix. | |
| 69.56 | 100 |
| 31.22 | 0 |

## $C_9H_7N$
Quinoline
*v.* 838, 1066, 1399, 1520

## $C_9H_8$
Indene
1528. *v.* p. 180
B = $C_{10}H_8$
Naphthalene

1529. *v.* p. 180
B = $C_{12}H_{10}$
Acenaphthene

1530. *v.* p. 180
B = $C_{13}H_{10}$
Fluorene

## $C_9H_8O_2$
Cinnamic acid
1530.1. (274.1)
B = $C_{10}H_8O$
α-Naphthol

| °C | Wt. % A |
|---|---|
| A | |
| 133.0 | 100 |
| A + B | |
| 68.0E | 37 |
| B | |
| 95.0 | 0 |

1530.2. (274.1)
B = $C_{10}H_8O$
β-Naphthol

| | |
|---|---|
| A | |
| 133.0 | 100 |
| A + B | |
| 87.0E | 48 |
| B | |
| 121.0 | 0 |

1531. (101)
B = $C_{10}H_{16}O$
Camphor

| °C | Mol % A |
|---|---|
| A | |
| 133.0 | 100 |
| A + B | |
| 71.5E | 36.6 |
| B | |
| 178.0 | 0 |

*v. also* 154, 183, 208, 606.1, 781.1, 883.1, 910.1, 935.1, 1066.1, 1094.1, 1121.1, 1147.1, 1173. 1, 1400, 1464

## $C_9H_{10}O_2$
Hydrocinnamic acid
*v.* 97, 347, 414, 1465, 1509

## $C_9H_{10}O_2$
Ethyl benzoate
*v.* 155

## $C_9H_{10}O_2$
Methyl *p*-toluate
*v.* 156

## $C_9H_{10}O_3$
Methyl *d*-mandelate
1532. (72)
B = $C_9H_{10}O_3$
Methyl *l*-mandelate

| °C | Mol % A |
|---|---|
| A | |
| 54.6 | 100 |
| 53.1 | 95 |
| 51.7 | 90 |
| 48.9 | 80 |
| A + AB | |
| 46.0E | 70 |
| AB | |
| 48.8 | 60 |
| **50.0** | **50** |
| 48.8 | 40 |
| AB + B | |
| 46.0E | 30 |
| B | |
| 48.9 | 20 |
| 51.7 | 10 |
| 53.1 | 5 |
| 54.6 | 0 |

## $C_9H_{10}O_3$
Methyl anisate
*v.* 157

## $C_9H_{11}NO$
*o*-Acettoluide
1533. (169)
B = $C_9H_{11}NO$
*p*-Acettoluide

| °C | % A |
|---|---|
| A | |
| 109.15 | 100.0 |
| 107.75 | 97.58 |
| 103.2 | 90.42 |
| 100.8 | 86.4 |
| B | |
| 147.0 | 0 |

## $C_9H_{12}$
Mesitylene
*v.* 1284

## $C_9H_{12}N_2O$
*p*-Nitrosopropylaniline
1534. (201)
B = $C_9H_{12}N_2O_2$
*p*-Nitropropylaniline

| °C | Wt. % A |
|---|---|
| Mix. | |
| 56.5 | 100 |
| 40.5† | 40.5 |
| 62.9 | 0 |

## $C_9H_{13}N$
2, 4, 6-Trimethylaniline
*v.* 282.2

## $C_{10}H_{15}NO$
*d*-Carvoxime
1535. (1)
B = $C_{10}H_{15}NO$
*l*-Carvoxime

| °C | Mol % A |
|---|---|
| A | |
| 72.0 | 100 |
| Mixed crystals | |
| $t_L$ | $t_S$ |
| A + AB | |
| 75.4 | 73.0 | 95 |
| 79.0 | 75.0 | 90 |
| 84.6 | 80.0 | 80 |
| 88.2 | 85.0 | 70 |
| 90.4 | 89.0 | 60 |
| AB | | |
| **91.4** | | **50** |
| AB + B | | |
| 90.4 | 89.0 | 40 |
| 88.2 | 85.0 | 30 |
| 84.6 | 80.0 | 20 |
| 79.0 | 75.0 | 10 |
| 75.4 | 73.0 | 5 |
| 72.0 | | 0 |

## $C_{10}H_5N_3O_6$
1, 2, 5-Trinitronaphthalene
1536. (369)
B = $C_{10}H_5N_3O_6$
1, 3, 5-Trinitronaphthalene

| °C | Wt. % A |
|---|---|
| Mix. | |
| 114.0 | 100 |
| 115.0 | 90 |
| 117.0 | 80 |
| 120.0 | 70 |
| 122.5 | 60 |
| 124.0 | 50 |
| 124.5 | 40 |
| 125.0 | 30 |
| 125.5 | 20 |
| 126.0 | 10 |
| 126.0 | 0 |

*v. also* 1878

1537. (369)
B = $C_{10}H_5N_3O_6$
1, 3, 8-Trinitronaphthalene

| °C | Wt. % A |
|---|---|
| A | |
| 114.0 | 100 |
| 110.0 | 90 |
| 105.5 | 80 |
| 101.0 | 70 |
| A + B | |
| 96.0E | 60 |
| B | |
| 153.0 | 50 |
| 174.0 | 40 |
| 186.0 | 30 |
| 196.0 | 20 |
| 205.0 | 10 |
| 214.0 | 0 |

1538. (369)
B = $C_{10}H_5N_3O_6$
1, 4, 5-Trinitronaphthalene

| | |
|---|---|
| Mix. | |
| 114.0 | 100 |
| 124.0 | 90 |
| 128.5 | 80 |
| Immiscible liquids | |
| 130.0 | 70 |
| 130.0 | 60 |
| 130.0 | 50 |
| 130.0 | 40 |
| 130.0 | 30 |
| Mix. | |
| 134.0 | 20 |
| 140.5 | 10 |
| 147.5 | 0 |

*v. also* 1878

## $C_{10}H_5N_3O_6$
1, 3, 5-Trinitronaphthalene
1539. (369)
B = $C_{10}H_5N_3O_6$
1, 3, 8-Trinitronaphthalene

| °C | | Mol % A |
|---|---|---|
| $t_L$ | $t_S$ | |
| A | | |
| 126.0 | | 100 |
| 122.5 | 120.0 | 95 |
| 120.0 | 118.0† | 90 |
| 118.6 | 116.5 | 85 |
| A + Mix. (A + $A_3B$) | | |
| 104.0E | | 77.5 |
| $A_3B$ | | |
| **112.5** | | **75** |
| Mix. ($A_3B$ + AB) | | |
| 107.5 | 97.0 | 70 |
| Mix. ($A_3B$ + AB) + AB | | |
| 97.0E | | 64 |

1539.—(*Continued*)

| °C | | Mol % A |
|---|---|---|
| $t_L$ | $t_S$ | |
| AB + $AB_2$ | | |
| 104.0U | | 60.3 |
| $AB_2$ | | |
| 124.0 | 104.0 | 55 |
| 136.0 | 104.0 | 50 |
| 166.0 | | 40 |
| **185.0** | | **33.3** |
| 197.0 | 194.0 | 20 |
| 205.5 | 203.0 | 10 |
| B | | |
| 214.0 | | 0 |

1540. (369)
B = $C_{10}H_6N_2O_6$
1, 4, 5-Trinitronaphthalene

| °C | Wt. % A |
|---|---|
| Mix. | |
| 126.0 | 100 |
| 130.0 | 90 |
| Immiscible liquids | |
| 131.0 | 80 |
| 131.0 | 70 |
| 131.0 | 60 |
| 131.0 | 50 |
| Mix. | |
| 134.0 | 40 |
| 137.0 | 30 |
| 139.5 | 20 |
| 142.0 | 10 |
| 147.5 | 0 |

1541. (369)
B = $C_{10}H_6N_2O_4$
1, 5-Dinitronaphthalene

| A | |
|---|---|
| 126.0 | 100.0 |
| A + B | |
| 100.0E | 88.5 |
| B | |
| 130.0 | 80 |
| 150.0 | 70 |
| 163.5 | 60 |
| 175.0 | 50 |
| 186.0 | 40 |
| 195.0 | 30 |
| 202.0 | 20 |
| 208.5 | 10 |
| 215.0 | 0 |

*v. also* 1879

1542. (369)
B = $C_{10}H_6N_2O_4$
1, 8-Dinitronaphthalene

| A | |
|---|---|
| 126.0 | 100 |
| 110.0 | 90 |
| A + B | |
| 88.0E | 79 |
| B | |
| 98.5 | 70 |
| 109.5 | 60 |
| 120.0 | 50 |

1542.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 130.5 | 40 |
| 141.0 | 30 |
| 151.5 | 20 |
| 161.5 | 10 |
| 171.0 | 0 |

*v. also* 1536, 1878, 1879

$C_{10}H_7N_3O_6$
1, 3, 8-Trinitronaphthalene

1543. (369)
B = $C_{10}H_5N_3O_6$
1, 4, 5-Trinitronaphthalene
Mixed crystals

| | |
|---|---|
| 214.0 | 100 |
| 208.0 | 90 |
| 199 | 80 |
| 187.0 | 70 |
| 169.0 | 60 |
| 149.0 | 50 |
| 128.0 | 40 |
| 105.0E | 29 |
| 119.0 | 20 |
| 134.0 | 10 |
| 147.5 | 0 |

Mixtures containing from 50 to 21 Mol % A freeze completely at 105.0°

1544. (369)
B = $C_{10}H_6N_2O_4$
1, 5-Dinitronaphthalene
Mix.

| | |
|---|---|
| 214.0 | 100 |
| 178.0 | 90 |
| 167.0 | 80 |
| 165.0† | 73 |
| 174.0 | 60 |
| 184.0 | 50 |
| 193.5 | 40 |
| 201.5 | 30 |
| 207.5 | 20 |
| 211.5 | 10 |
| 215.0 | 0 |

*v. also* 1880

1545. (369)
B = $C_{10}H_6N_2O_4$
1, 8-Dinitronaphthalene
Mix.

| | |
|---|---|
| 214.0 | 100 |
| 195.5 | 90 |
| 178.0 | 80 |
| 163.0 | 70 |
| 148.0 | 60 |
| 136.0 | 50 |
| 135.0† | 42 |
| 140.0 | 30 |
| 150.0 | 20 |

1545.—(*Continued*)

| °C | Wt. % A |
|---|---|
| Mix. | |
| 160.0 | 10 |
| 171.0 | 0 |

*v. also* 1537, 1539, 1878, 1880

$C_{10}H_5N_3O_6$
1, 4, 5-Trinitronaphthalene
*v.* 1538, 1540, 1543

2, 4, 6-Trinitronaphthalene
*v.* 1268.4

$C_{10}H_6N_2O_4$
1, 5-Dinitronaphthalene

1546. (369)
B = $C_{10}H_6N_2O_4$
1, 8-Dinitronaphthalene
Mix.

| | |
|---|---|
| 215.0 | 100 |
| 205.5 | 90 |
| 200.5 | 80 |
| 195.0 | 70 |
| 188.5 | 60 |
| 180.0 | 50 |
| 166.5 | 40 |
| 150.5 | 30 |
| 145.5† | 22 |
| 159.5 | 10 |
| 171.0 | 0 |

*v. also* 1879, 1880, 1881

1547. (369)
B = $C_{10}H_7NO_2$
α-Nitronaphthalene
Mixed crystals

| | |
|---|---|
| 215.0 | 100 |
| 207.0 | 90 |
| 198.5 | 80 |
| 190.0 | 70 |
| 180.0 | 60 |
| 168.0 | 50 |
| 150.0 | 40 |
| 130.0 | 30 |
| 105.0 | 20 |
| 54.5E | 9 |
| 57.0 | 0 |

Mixtures containing from 50 to 0 Wt. % A freeze completely at 54.5°

*v. also* 1541, 1544, 1879, 1880, 1881

$C_{10}H_6N_2O_4$
1, 8-Dinitronaphthalene

1548. (369)
B = $C_{10}H_7NO_2$
α-Nitronaphthalene

1548.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 171.0 | 100 |
| 159.0 | 90 |
| 144.0 | 80 |
| 128.0 | 70 |
| 110.5 | 60 |
| 94.5 | 50 |
| 80.0 | 40 |
| 65.0 | 30 |
| 50.0 | 20 |
| A + B | |
| 44.5E | 16 |
| B | |
| 49.0 | 10 |
| 57.0 | 0 |

*v. also* 1542, 1545, 1546, 1879, 1880, 1881

$C_{10}H_7Br$
α-Bromonaphthalene, *v.* 607, 638

$C_{10}H_7Br$
β-Bromonaphthalene, *v.* 608, 639

$C_{10}H_7Cl$
α-Chloronaphthalene, *v.* 609, 640

$C_{10}H_7Cl$
β-Chloronaphthalene, *v.* 610

$C_{10}H_7NO_2$
α-Nitronaphthalene

1549. *v.* p. 180
B = $C_{10}H_8$
Naphthalene

1550. *v.* p. 180
B = $C_{10}H_9N$
α-Naphthylamine

1551. *v.* p. 180
B = $C_{10}H_{16}O$
Camphor

1552. (15)
B = $C_{12}H_{11}N$
Diphenylamine

| A | |
|---|---|
| 55.1 | 100.0 |
| 50.1 | 90.9 |
| 32.2 | 66.67 |
| A + B | |
| 23.3E | 50.0 |
| B | |
| 28.2 | 33.3 |
| 40.2 | 20.0 |
| 46.4 | 9.1 |
| 50.9 | 0.0 |

*v. also* 398, 611, 641, 1095, 1122, 1148,

1547, 1548, 1866, 1881

$C_{10}H_8$
Naphthalene

1553. *v.* p. 180
B = $C_{10}H_8O$
α-Naphthol

1554. (82, 337, 406, 467)
B = $C_{10}H_8O$
β-Naphthol

| °C | | Wt. % A |
|---|---|---|
| $t_L$ | $t_S$ | |
| Mix. | | |
| 80.0 | | 100 |
| 82.0 | 80.0 | 95 |
| 84.1 | 80.0 | 90 |
| 88.3 | 81.0 | 80 |
| 92.5 | 82.5 | 70 |
| 96.7 | 84.0 | 60 |
| 100.9 | 87.0 | 50 |
| 105.2 | 93.0 | 40 |
| 109.5 | 98.0 | 30 |
| 113.7 | 104.0 | 20 |
| 118.0 | 111.0 | 10 |
| 120.0 | 115.5 | 5 |
| 122.0 | | 0 |

1555. (15, 406, 467)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 80.0 | 100 |
| 75.0 | 90 |
| 69.0 | 80 |
| 65.5 | 70 |
| 58.0 | 60 |
| 54.0 | 50 |
| 46.0 | 40 |
| A + B | |
| 28.0E | 27 |
| B | |
| 35.0 | 20 |
| 41.5 | 10 |
| 49.0 | 0 |

1556. (406, 467)
B = $C_{10}H_9N$
β-Naphthylamine

| °C | | Wt. % A |
|---|---|---|
| $t_L$ | $t_S$ | |
| Mix. | | |
| 80.0 | | 100 |
| 76.0 | 74.5 | 90 |
| 75.0 | 72.5 | 80 |
| 72.5† | 72.0† | 70 |
| 76.5 | 73.0 | 60 |
| 82.0 | 74.0 | 50 |
| 85.5 | 77.0 | 40 |
| 91.5 | 87.0 | 30 |
| 96.0 | 92.0 | 20 |
| 103.5 | 100.0 | 10 |
| 111.0 | | 0 |

1557. (288)
B = $C_{10}H_{10}$
Dihydronaphthalene

| °C | Mol % A |
|---|---|
| Mix. | |
| 79.33 | 100 |
| 74.5 | 90 |
| 69.5 | 80 |
| 63.7 | 70 |
| 57.5 | 60 |
| 50.6 | 50 |
| 43.0 | 40 |
| 35.2 | 30 |
| 27.0 | 20 |

1558. (401)
B = $C_{10}H_{14}O$
Thymol

| °C | Wt. % A |
|---|---|
| A | |
| 80.0 | 100 |
| 75.4 | 90 |
| 70.5 | 80 |
| 65.4 | 70 |
| 59.7 | 60 |
| 53.3 | 50 |
| 44.8 | 40 |
| A + B | |
| 30.0E | 28.7 |
| B | |
| 36.7 | 20 |
| 43.5 | 10 |
| 49.2 | 0 |

1559. (15, 406)
B = $C_{10}H_{15}BrO$
Bromocamphor

| A | |
|---|---|
| 80.0 | 100 |
| 77.0 | 90 |
| 73.5 | 80 |
| 67.5 | 70 |
| 61.0 | 60 |
| 53.0 | 50 |
| A + B | |
| 41.0E | 37 |
| B | |
| 47.0 | 30 |
| 56.0 | 20 |
| 66.5 | 10 |
| 76.0 | 0 |

1560. *v.* p. 180
B = $C_{10}H_{16}$
Camphene

1561. *v.* p. 180
B = $C_{10}H_{16}O$
Camphor

1562. (413)
B = $C_{10}H_{20}O$
Menthol

| °C | Mol % A |
|---|---|
| A | |
| 80.1 | 100 |
| 75.1 | 90 |
| 70.6 | 80 |
| 66.4 | 70 |

**$C_{10}H_8$.—**
*(Continued)*

1562.—*(Continued)*

| °C | Mol % A |
|---|---|
| **A** | |
| 62.2 | 60 |
| 57.7 | 50 |
| 52.6 | 40 |
| 44.8 | 30 |
| **A + B** | |
| 31.7E | 17 |
| **B** | |
| 35.5 | 10 |
| 42.0 | 0 |

1563. *v.* p. 180
B = $C_{12}H_{10}$
Diphenyl

1564. *v.* p. 180
B = $C_{12}H_{11}N$
Diphenylamine

1565. (413)
B = $C_{12}H_{18}O_8$
Diethyl diacetyltartrate

| | |
|---|---|
| **A** | |
| 80.1 | 100 |
| **A + B** | |
| 43.0E | 50.0 |
| **B** | |
| 67.0 | 0 |

1566. *v.* p. 180
B = $C_{13}H_{10}$
Fluorene

1567. *v.* p. 180
B = $C_{13}H_{12}$
Diphenylmethane

1568. (339, 406, 467)
B = $C_{14}H_{10}$
Anthracene

| °C | Wt. % A |
|---|---|
| **A** | |
| 80.0 | 100 |
| **A + B** | |
| 77.0E | 90 |
| **B** | |
| 102.0 | 80 |
| 124.0 | 70 |
| 143.0 | 60 |
| 155.0 | 50 |
| 168.0 | 40 |
| 178.0 | 30 |
| 192.0 | 20 |
| 198.0 | 10 |
| 213.0 | 0 |

1569. (339, 406, 467)
B = $C_{14}H_{10}$
Phenanthrene

| | |
|---|---|
| **A** | |
| 80.0 | 100 |
| 75.0 | 90 |
| 70.0 | 80 |
| 65.0 | 70 |
| 57.0 | 60 |

1569.—*(Continued)*

| °C | Wt. % A |
|---|---|
| **A + B** | |
| 48.5E | 54 |
| **B** | |
| 54.0 | 40 |
| 64.5 | 30 |
| 74.5 | 20 |
| 85.0 | 10 |
| 95.0 | 0 |

1570. (80)
B = $C_{18}H_{36}O_2$
Stearic acid

1571. (467)
B = $C_{19}H_{16}$
Triphenylmethane

| °C | Mol % A |
|---|---|
| **A** | |
| 80 | 100 |
| 68 | 80 |
| 59 | 66.67 |
| **B** | |
| 53 | 50 |
| 61 | 33.33 |
| 90 | 0 |

1572. (251)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| °C | Wt. % A |
|---|---|
| **A** | |
| 80.3 | 100 |
| **A + B** | |
| 69.2E | 70 |
| **B** | |
| 159.2 | 0 |

1573. (360)
B = $C_{32}H_{64}O_2$
Cetyl palmitate

| | |
|---|---|
| **A** | |
| 79.3 | 100 |
| 75.7 | 80.0 |
| 70.4 | 66.67 |
| 62.8 | 50.0 |
| 49.2 | 33.3 |
| 39.8 | 25.0 |
| **A + B** | |
| 36.6E | 22.2 |
| **B** | |
| 38.4 | 16.66 |
| 39.3 | 14.48 |
| 43.9 | 0.0 |

1574. (360)
B = $C_{57}H_{110}O_6$
Tristearin

| | |
|---|---|
| **A** | |
| 79.3 | 100 |
| 71.8 | 66.67 |
| 64.3 | 50.0 |
| 50.9 | 33.0 |
| **A + B** | |
| 46.3E | 25.0 |
| **B** | |
| 48.2 | 20.0 |
| 54.8 | 0.0 |

*v. also* 11, 27, 51, 98, 111, 209, 226, 237, 252, 258, 283, 348, 380, 388, 415, 465.1, 465.2, 468, 470.1, 490, 503, 516, 523.2, 527, 568, 612, 642, 695, 699, 719, 744, 762, 782, 799, 807, 827, 861, 884, 936, 1005, 1034, 1067, 1096, 1123, 1149, 1271, 1316, 1331, 1352, 1401, 1443, 1446, 1475, 1492, 1528, 1549

**$C_{10}H_8N_2$**
γ-γ-Dipyridyl
*v.* 569

**$C_{10}H_8N_2O_2$**
Furfuralazine
1575. (368)
B = $C_{10}H_8N_2S_2$
Thiophenalazine

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| 113.0 | 100 |
| 90.5E | 68 |
| 156.0 | 0 |

Mixtures containing 87 to 25 Wt. % A freeze completely at 90.5°

1576. (368)
B = $C_{14}H_{12}N_2$
Benzalazine

| | |
|---|---|
| Mixed crystals | |
| 113.0 | 100 |
| 72.8E | 36 |
| 92.0 | 0 |

Mixtures containing 70 to 18 Wt. % A freeze completely at 72.8°

**$C_{10}H_8N_2S_2$**
Thiophenalazine
*v.* 1575

**$C_{10}H_8O$**
α-Naphthol
1577. *v.* p. 180
B = $C_{10}H_8O$
β-Naphthol

1578. (264, 467)
B = $C_{10}H_9N$
α-Naphthylamine

| | |
|---|---|
| **A** | |
| 92.0 | 100 |
| 88.0 | 90 |
| 82.8 | 80 |
| 75.8 | 70 |
| 67.6 | 60 |
| 58.0 | 50 |
| 47.5 | 40 |

1578.—*(Continued)*

| °C | Wt. % A |
|---|---|
| **A + $AB_4$** | |
| 40.5E | 34 |
| **$AB_4$** | |
| **43.0** | **20** |
| **$AB_4$ + B** | |
| 42.0E | 13 |
| **B** | |
| 48.0 | 0 |

1579. (264, 467)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| **A** | |
| 92.0 | 100 |
| 86.8 | 90 |
| 79.2 | 80 |
| 69.7 | 70 |
| **A + B** | |
| 47.0E | 56.5 |
| **B** | |
| 57.0 | 50 |
| 71.7 | 40 |
| 84.0 | 30 |
| 93.8 | 20 |
| 101.8 | 10 |
| 109.0 | 0 |

1580. (234)
B = $C_{10}H_{16}O$
Fenchone

| | |
|---|---|
| **A** | |
| 95.0 | 100 |
| **A + AB** | |
| 55.0E | 62 |
| **AB** | |
| **60.5** | **48.5** |
| **AB + B** | |
| 1.0E | 7 |
| **B** | |
| 5.3 | 0 |

1581. (36)
B = $C_{10}H_{18}O$
Cineole

| | |
|---|---|
| **A** | |
| 93.5 | 100 |
| **A + AB** | |
| 60.0E | 62.5 |
| **AB** | |
| **+75.0** | **48.3** |
| **AB + B** | |
| − 6.0E | 4 |
| **B** | |
| + 1.0 | 0 |

1582. (238)
B = $C_{11}H_{12}N_2O$
Antipyrine

| | |
|---|---|
| **A** | |
| 92.7 | 100 |
| No solid phase | |
| 59.3 to 51.0 | 78.1 to 42.6 |
| **$AB_2$ + B** | |
| **73E** | **27** |
| **B** | |
| 109.9 | 0 |

1583. *v.* p. 180
B = $C_{12}H_9N$
Carbazole

1583.1. (274.2)
B = $C_{12}H_{10}N_2$
Azobenzene

| °C | Wt. % A |
|---|---|
| **A** | |
| 95.5 | 100 |
| **A + B** | |
| 48.0E | 33.5 |
| **B** | |
| 67 | 0 |

1584. (261, 467)
B = $C_{12}H_{11}N$,
Diphenylamine

| | |
|---|---|
| **A** | |
| 92.0 | 100 |
| **A + B** | |
| 38.5E | 24 |
| **B** | |
| 52.0 | 0 |

1585. (262)
B = $C_{13}H_9N$
Acridine

| | |
|---|---|
| **A** | |
| 93.1 | 100 |
| 87.5 | 90 |
| 78.5 | 80 |
| **A + AB** | |
| 73.0E | 77 |
| **AB** | |
| 85.5 | 70 |
| 104.0 | 60 |
| 113.5 | 50 |
| **115.5** | **44.5** |
| 113.5 | 40 |
| 102.5 | 30 |
| **AB + $AB_2$** | |
| 97.0U | 27 |
| **$AB_2$** | |
| 96.0 | 20 |
| **$AB_2$ + B** | |
| 94.0E | 11 |
| **B** | |
| 101.5 | 5 |
| 106.5 | 0 |

1586. (274)
B = $C_{13}H_{10}O$
Benzophenone

| | |
|---|---|
| **A** | |
| 93.0 | 100 |
| **A + AB** | |
| 37.1E | 51 |
| **AB** | |
| **38.0** | **44.1** |
| **AB + B** | |
| 26.0E | 25 |
| **B** | |
| 47.0 | 0 |

1587. (235)
B = $C_{13}H_{12}$
Diphenylmethane

1587.—*(Continued)*

| °C | Wt. % A |
|---|---|
| **A** | |
| 93.1 | 100 |
| **A + B** | |
| 19.6E | 7.5 |
| **B** | |
| 23.9 | 0 |

1587.1. (234.1)
B = $C_{13}H_{12}O$
Benzhydrol

| | |
|---|---|
| **A** | |
| 95.0 | 100 |
| **A + B** | |
| 18.0E | 35 |
| **B** | |
| 64.5 | 0 |

1588. (254)
B = $C_{19}H_{16}$
Triphenylmethane

| | |
|---|---|
| **A** | |
| 93.0 | 100 |
| **A + B** | |
| 63.0E | 30 |
| **B** | |
| 91.0 | 0 |

1589. (271)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| **A** | |
| 92.5 | 100 |
| **A + B** | |
| 60.2E | 62 |
| **B** | |
| 159.2 | 0 |

*v. also* 158, 210, 227, 307, 449, 458.9, 459.9, 491, 1204, 1220, 1226, 1231, 1244, 1257, 1387, 1429, 1466, 1476, 1507, 1530.1, 1553, 1860

**$C_{10}H_8O$**
β-Naphthol
1590. (264, 467)
B = $C_{10}H_9N$
α-Naphthylamine

| | |
|---|---|
| **A** | |
| 122.0 | 100 |
| 111.5 | 90 |
| 100.3 | 80 |
| 88.5 | 70 |
| 76.0 | 60 |
| **A + $A_2B_3$** | |
| 56.2E | 49 |
| **$A_2B_3$** | |
| **66** | **40.1** |
| 61.0 | 30 |
| 48.0 | 20 |
| **$A_2B_3$ + B** | |
| 36.0E | 11 |
| **B** | |
| 48.0 | 0 |

**1591.** (264, 467)
B = $C_{10}H_9N$
β-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 122.0 | 100 |
| A + $A_2B$ | |
| 115.0E | 91 |
| $A_2B$ | |
| 108.8 | 80 |
| **120.3** | *ca.* **70** |
| 119.6 | 60 |
| 118.1 | 50 |
| 115.3 | 40 |
| 112.0 | 30 |
| 108.0 | 20 |
| $A_2B$ + B | |
| 104.0E | 11.5 |
| B | |
| 109.0 | 0 |

**1592.** (234)
B = $C_{10}H_{16}O$
Fenchone

| | |
|---|---|
| A | |
| 121.0 | 100 |
| A + AB | |
| +23.0U | 44 |
| AB + B | |
| − 9.8E | 19 |
| B | |
| + 5.3 | 0 |

**1593.** (36)
B = $C_{10}H_{18}O$
Cineole

| | |
|---|---|
| A | |
| 122.0 | 100 |
| A + AB | |
| 43.5E | 52.5 |
| AB | |
| **+48.0** | **48.3** |
| AB + B | |
| − 3.5E | 8 |
| B | |
| + 1.0 | 0 |

**1594.** (238)
B = $C_{11}H_{12}N_2O$
Antipyrine

| | |
|---|---|
| A | |
| 122.0 | 100 |
| No solid phase | |
| 70 to 73 | 72.6 to 50.5 |
| AB | |
| **79.5** | **43.3** |
| AB + B | |
| 72.0E | 30 |
| B | |
| 109.8 | 0 |

**1595.** *v.* p. 180
B = $C_{12}H_9N$
Carbazole

**1595.1.** (274.2)
B = $C_{12}H_{10}N_2$
Azobenzene

**1595.1.**—*(Cont'd)*

| °C | Wt. % A |
|---|---|
| A | |
| 121.0 | 100 |
| A + B | |
| 51.0E | 18.0 |
| B | |
| 67 | 0 |

**1596.** (261, 467)
B = $C_{12}H_{11}N$
Diphenylamine

| | |
|---|---|
| A | |
| 122.0 | 100 |
| A + B | |
| 43.8E | 16.5 |
| B | |
| 52.0 | 0 |

**1597.** (262)
B = $C_{13}H_9N$
Acridine

| | |
|---|---|
| A | |
| 121.0 | 100 |
| 113.5 | 90 |
| A + $A_3B_2$ | |
| 110.0E | 85 |
| $A_3B_2$ | |
| 115.0 | 80 |
| 126.5 | 70 |
| 134.0 | 60 |
| **135.5** | **54.6** |
| 134.0 | 50 |
| 124.0 | 40 |
| 107.0 | 30 |
| $A_2B_2$ + $AB_2$ | |
| 96.0U | 25 |
| $AB_2$ | |
| 95.0 | 20 |
| $AB_2$ + B | |
| 92.0E | 13.5 |
| B | |
| 96.0 | 10 |
| 102.0 | 5 |
| 106.5 | 0 |

**1598.** (274)
B = $C_{13}H_{10}O$
Benzophenone

| | |
|---|---|
| A | |
| 121.9 | 100 |
| A + B | |
| 19.0E | 30 |
| B | |
| 47.0 | 0 |

**1599.** (34, 38)
B = $C_{13}H_{10}O_3$
Salol

| °C | Mol % A |
|---|---|
| A | |
| 124.5 | 100 |
| 120 | 97.0 |
| 110 | 81.8 |
| 100 | 67.3 |
| 90 | 55.0 |
| 80 | 45.0 |
| 70 | 37.6 |

**1599.**—*(Continued)*

| °C | Mol % A |
|---|---|
| A | |
| 60 | 30.0 |
| 50 | 23.2 |
| 40 | 16.5 |
| A + B | |
| 34.5E | 13.0 |
| B | |
| 42.5 | 0.0 |

*v. also* 1877

**1600.** (235)
B = $C_{13}H_{12}$
Diphenylmethane

| °C | Wt. % A |
|---|---|
| A | |
| 122.0 | 100 |
| A + B | |
| 22.6E | 5 |
| B | |
| 23.8 | 0 |

**1600.1.** (234.1)
B = $C_{13}H_{12}O$
Benzhydrol

| °C | Mol % A |
|---|---|
| A | |
| 121.0 | 100 |
| A + $A_2B_3$ | |
| 61.0E | 37.5 |
| $A_2B_3$ | |
| 62.0 | 34.3 |
| $A_2B_3$ + B | |
| 47.0E | 20 |
| B | |
| 64.5 | 0 |

**1601.** *v.* p. 180
B = $C_{14}H_{10}$
Anthracene

**1602.** (254)
B = $C_{19}H_{16}$
Triphenylmethane

| °C | Wt. % A |
|---|---|
| A | |
| 121.0 | 100 |
| A + B | |
| 77.0E | 20 |
| B | |
| 91.0 | 0 |

**1603.** (271)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| A | |
| 121.5 | 100 |
| A + B | |
| 86.0E | 50 |
| B | |
| 159.2 | 0 |

*v. also* 159, 211, 228, 253, 308, 450, 458.91, 459.91, 492, 614, 808, 1006, 1124, 1205, 1221, 1227, 1232, 1245, 1258, 1388, 1430, 1467, 1477, 1488, 1508, 1530.2, 1554, 1577, 1860, 1877

**$C_{10}H_8O_2$**
1, 4-Dihydroxy-naphthalene
**1604.** (240)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 183.0 | 100 |
| A + AB | |
| 129.0E | 61.0 |
| AB | |
| **143** | **52.8** |
| AB + B | |
| 44.0E | 6 |
| B | |
| 48.3 | 0 |

**1605.** (240)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| A | |
| 183.0 | 100 |
| A + AB | |
| 125.0E | 64 |
| AB | |
| **143** | **52.8** |
| AB + B | |
| 96.0E | 24 |
| B | |
| 111.0 | 0 |

*v. also* 451, 1233, 1246, 1431

**$C_{10}H_8O_2$**
1, 5-Dihydroxy-naphthalene
**1606.** (240)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 250.0 | 100 |
| A + B | |
| 44.0E | 5 |
| B | |
| 48.3 | 0 |

**1607.** (240)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| A | |
| 250.0 | 100 |
| A + AB | |
| 212.0E | 65 |
| AB | |
| **229.5** | **52.8** |
| AB + B | |
| 107.0E | 5 |
| B | |
| 111.0 | 0 |

*v. also* 1432

**$C_{10}H_8O_2$**
1, 6-Dihydroxy-naphthalene
**1608.** (240)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 134.0 | 100 |
| A + $A_2B_3$ | |
| 76.0E | 47 |
| $A_2B_3$ | |
| **84.5** | **42.8** |
| $A_2B_3$ + B | |
| 43.0E | 7.5 |
| B | |
| 48.5 | 0 |

**1609.** (240)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| A | |
| 133.0 | 100 |
| A + $A_2B_3$ | |
| 92.0E | 58 |
| $A_2B_3$ | |
| **110.5** | **42.8** |
| $A_2B_3$ + B | |
| 96.0E | 35 |
| B | |
| 111.0 | 0 |

*v. also* 452, 1235, 1247, 1259, 1433

**$C_{10}H_8O_2$**
1, 8-Dihydroxy-naphthalene
**1610.** (240)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 137.0 | 100 |
| A + AB | |
| 74.0E | 55 |
| AB | |
| **76.5** | **52.8** |
| AB + B | |
| 41.0E | 16 |
| B | |
| 48.3 | 0 |

**1611.** (240)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| A | |
| 137.0 | 100 |
| A + AB | |
| 75.0E | 62 |
| AB | |
| **124.0** | **52.8** |
| AB + B | |
| 76.0E | 45 |
| B | |
| 111.0 | 0 |

*v. also* 1236, 1248, 1260, 1434

**$C_{10}H_8O_2$**
2, 3-Dihydroxy-naphthalene
**1612.** (240)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 162.0 | 100 |
| A + $A_2B_3$ | |
| 97.0E | 45.5 |
| $A_2B_3$ | |
| **103.0** | **42.8** |
| $A_2B_3$ + B | |
| 35.0E | 13 |
| B | |
| 48.3 | 0 |

**1613.** (240)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| A | |
| 162.0 | 100 |
| A + AB | |
| 145.0E | 76 |
| AB | |
| **168.0** | **52.8** |
| AB + B | |
| 106.5E | 3 |
| B | |
| 111.0 | 0 |

*v. also* 453, 1237, 1249, 1261, 1435

**$C_{10}H_8O_2$**
2, 6-Dihydroxy-naphthalene
**1614.** (240)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 216.0 | 100 |
| A + B | |
| 46.0E | 2 |
| B | |
| 48.3 | 0 |

**1615.** (240)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| A | |
| 216.0 | 100 |
| A + $AB_2$ | |
| 165.0E | 59 |
| $AB_2$ | |
| **171.5** | **35.8** |
| $AB_2$ + B | |
| 109.0E | 2 |
| B | |
| 111.0 | 0 |

*v. also* 454, 1238, 1250, 1262, 1436

## $C_{10}H_8O_2$
2, 7-Dihydroxy-naphthalene

1616. (240)
B = $C_{10}H_9N$
α-Naphthylamine

| °C | Wt. % A |
|---|---|
| A | |
| 186.0 | 100 |
| A + B | |
| 35.0E | 9 |
| B | |
| 48.3 | 0 |

1617. (240)
B = $C_{10}H_9N$
β-Naphthylamine

| | |
|---|---|
| A | |
| 186.0 | 100 |
| A + AB | |
| 155.0E | 64 |
| AB | |
| **163.0** | **52.8** |
| AB + B | |
| 108.0E | 1.5 |
| B | |
| 111.0 | 0 |

*v. also* 1239, 1251, 1263, 1437

## $C_{10}H_9BrO_4$
Diacetyl-bromohydroquinol

1618. (288)
B = $C_{10}H_9ClO_4$
Diacetyl-chlorohydroquinol

| °C | Mol % A |
|---|---|
| Mix. | |
| 70.3 | 100 |
| 62.0† | 46 |
| 68.46 | 0 |

## $C_{10}H_9N$
α-Naphthylamine

1619. (467)
B = $C_{12}H_{11}N$
Diphenylamine

| °C | Mol % A |
|---|---|
| A | |
| 50.0 | 100 |
| A + B | |
| 18E(?) | 50 |
| B | |
| 54.0 | 0 |

1620. (260)
B = $C_{13}H_{10}O$
Benzophenone

| °C | Wt. % A |
|---|---|
| A | |
| +47.7 | 100 |
| A + B | |
| − 2.0E | 43 |
| B | |
| +47.0 | 0 |

1621. (235)
B = $C_{13}H_{12}$
Diphenylmethane

| °C | Wt. % A |
|---|---|
| A | |
| 47.1 | 100 |
| A + B | |
| 9.5E | 37 |
| B | |
| 24.0 | 0 |

1621.1. (234.1)
B = $C_{13}H_{12}O$
Benzhydrol

| | |
|---|---|
| A | |
| 49.0 | 100 |
| A + B | |
| 16.0E | 62.5 |
| B | |
| 64.5 | 0 |

1622. (467)
B = $C_{14}H_{10}$
Anthracene

1623. (254)
B = $C_{19}H_{16}$
Triphenylmethane

| | |
|---|---|
| A | |
| 48.5 | 100 |
| A + B | |
| 37.0E | 67 |
| B | |
| 91.0 | 0 |

1624. (271)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| A | |
| 48.1 | 100 |
| A + $A_6B$ | |
| 37.0E | 95 |
| $A_6B$ | |
| **41.5** | **76.7** |
| $A_6B$ + B | |
| 38.0E | 66 |
| B | |
| 159.2 | 0 |

*v. also* 51.1, 348.1, 493, 545, 570, 720, 745, 763, 783, 809, 827.1, 885, 911, 937, 1006.1, 1068, 1097, 1125, 1150, 1174, 1222, 1353, 1364, 1371, 1378, 1402, 1468, 1478, 1521, 1550, 1555, 1578, 1590, 1604, 1606, 1608, 1610, 1612, 1614, 1616, 1860

## $C_{10}H_9N$
β-Naphthylamine

1625. *v.* p. 180
B = $C_{10}H_{16}O$
Camphor

1626. (260)
B = $C_{13}H_{10}O$
Benzophenone

| °C | Wt. % A |
|---|---|
| A | |
| 109.0 | 100 |
| A + B | |
| 34.5E | 23 |
| B | |
| 47.0 | 0 |

1627. (235)
B = $C_{13}H_{12}$
Diphenylmethane

| | |
|---|---|
| A | |
| 109.0 | 100 |
| A + B | |
| 21.4E | 5 |
| B | |
| 23.9 | 0 |

1627.1. (234.1)
B = $C_{13}H_{12}O$
Benzhydrol

| | |
|---|---|
| A | |
| 110.0 | 100 |
| A + B | |
| 51.0E | 21.0 |
| B | |
| 64.5 | 0 |

1628. *v.* p. 180
B = $C_{14}H_{10}$
Anthracene

1629. (254)
B = $C_{19}H_{16}$
Triphenylmethane

| | |
|---|---|
| A | |
| 108.5 | 100 |
| A + B | |
| 72.0E | 25 |
| B | |
| 91.0 | 0 |

1630. (271)
B = $C_{19}H_{16}O$
Triphenyl carbinol

| | |
|---|---|
| A | |
| 109.0 | 100 |
| A + $A_2B$ | |
| 91.8E | 62 |
| $A_2B$ | |
| **92.0** | **52.4** |
| $A_2B$ + B | |
| 91.8E | 42 |
| B | |
| 159.2 | 0 |

*v. also* 98.1, 283.1, 470.2, 494, 571, 721, 746, 764, 784, 827.2, 886, 912, 938,1006.2, 1069, 1098, 1126, 1151, 1175, 1205.1, 1223, 1354, 1365, 1372, 1379, 1403, 1479, 1522, 1556, 1579, 1591, 1605, 1607, 1609, 1611, 1613, 1615, 1617, 1860

## $C_{10}H_9NO_4$
*d*-5-Nitro-hydrindene-2-carboxylic acid

1631. (338)
B = $C_{10}H_9NO_4$
*l*-5-Nitro-hydrindene-2-carboxylic acid

| °C | Mol % A |
|---|---|
| A | |
| 116.0 | 100 |
| A + AB | |
| 107.5E | 88.3 |
| AB | |
| **122.0** | **50** |
| AB + B | |
| 107.5E | 11.7 |
| B | |
| 116.0 | 0 |

## $C_{10}H_{10}$
Dihydro-naphthalene
*v.* 1557

## $C_{10}H_{10}O_2$
Methyl cinnamate
*v.* 160, 212

## $C_{10}H_{10}O_3$
*p*-Methoxy-cinnamic acid

1632. (217)
B = $C_{14}H_{14}N_2O_3$
*p*-Azoxyanisole

| °C: Liquid crystals | °C: Solid phase | Mol % A |
|---|---|---|
| A | | |
| 185.5 | 170.6 | 100 |
| 180.5 | 164.0 | 90 |
| 174.0 | 158.0 | 80 |
| 167.0 | 151.0 | 70 |
| 160.0 | 143.5 | 60 |
| 153.0 | 136.0 | 50 |
| 146.5 | 127.0 | 40 |
| 139.5 | 117.0 | 30 |
| A + B | | |
| 107.6E | | 22 |
| B | | |
| 133.5 | 108.3 | 20 |
| 130.5† | 111.6 | 10 |
| 135.2 | 114.0 | 0 |

1633. (390)
B = $C_{16}H_{18}N_2O_3$
*p*-Azoxyphenetole

| °C: Liquid crystals $t_L$ | °C: Liquid crystals $t_S$ | °C: Solid phase | Mol % A |
|---|---|---|---|
| A | | | |
| 188.3 | 188.3 | 173.8 | 100 |
| 184.0 | 182.5 | 167.5 | 90 |
| 179.0 | 176.5 | 161.0 | 80 |
| 173.5 | 171.0 | 155.0 | 70 |
| 169.0 | 166.5 | 148.0 | 60 |
| 165.0 | 163.0 | 140.8 | 50 |
| 162.0 | 160.0 | 132.5 | 40 |

1633.—(*Continued*)

| °C: Liquid crystals $t_L$ | °C: Liquid crystals $t_S$ | °C: Solid phase | Mol % A |
|---|---|---|---|
| A + B | | | |
| | | 125.2E | 33 |
| B | | | |
| 159.5 | 158.5 | 127.0 | 30 |
| 158.1 | 158.0 | 132.0 | 20 |
| 158.0† | 158.0† | | 18 |
| 160.0 | 159.0 | 136.0 | 10 |
| 167.25 | 167.25 | 138.4 | 0 |

*v. also* 1152

## $C_{10}H_{10}O_4$
Dimethyl tere-phthalate, *v.* 161

## $C_{10}H_{12}O$
Anethole

1634. (413)
B = $C_{10}H_{20}O$
Menthol

| °C | Mol % A |
|---|---|
| A | |
| 21.3 | 100 |
| 17.5 | 90 |
| 15.5 | 80 |
| 14.3 | 70 |
| A + B | |
| 13.9E | 65 |
| B | |
| 15.1 | 60 |
| 20.1 | 50 |
| 23.6 | 40 |
| 27.3 | 30 |
| 31.6 | 20 |
| 36.7 | 10 |
| 42.0 | 0 |

## $C_{10}H_{14}N_2$
Nicotine, *v.* 1007

## $C_{10}H_{14}N_2O$
Nitrosodiethyl-aniline

1635. (195)
B = $C_{10}H_{14}N_2O_2$
Nitrodiethylaniline
Mix.

| | |
|---|---|
| 82.2 | 100 |
| 73.0 | 0 |

## $C_{10}H_{14}O$
Thymol

1636. (36)
B = $C_{10}H_{18}O$
Cineole

| °C | Wt. % A |
|---|---|
| A | |
| +50.0 | 100 |
| A + AB | |
| − 6.0E | 62.5 |
| AB | |
| **+ 4.5** | **49.3** |
| AB + B | |
| −17.5E | 27.0 |
| B | |
| + 1.0 | 0 |

1637. (379)
B = $C_{13}H_{10}O$
Benzophenone

1638. (34)
B = $C_{13}H_{10}O_3$
Salol

| °C | Wt. % A |
|---|---|
| A | |
| 51.0 | 100 |
| 46.0 | 90 |
| 40.0 | 80 |
| 34.5 | 70 |
| 29.0 | 60 |
| 23.0 | 50 |
| 17.5 | 40 |
| A + B | |
| 13.0E | 34 |
| B | |
| 26.0 | 20 |
| 34.0 | 10 |
| 42.0 | 0 |

*v. also* 11.1, 162, 213, 229, 284, 468.1, 495, 615, 1070, 1420, 1558

## $C_{10}H_{14}O_8$
Dimethyl *d*-diacetyl-tartrate

1639. (1)
B = $C_{10}H_{14}O_8$
Dimethyl *l*-diacetyl-tartrate

| °C: Stable form | °C: Labile form | Mol % A |
|---|---|---|
| A | | |
| 104.3 | | 100 |
| 102.1 | | 95 |
| 99.8 | | 90 |
| 95.2 | | 80 |
| 90.2 | | 70 |
| A + AB | | |
| 83.0E | | 57.5 |
| AB | | |
| **83.8** | | **50** |
| AB + B | | |
| 83.0E | | 42.5 |
| B | | |
| 90.2 | | 30 |
| 95.2 | | 20 |
| 99.8 | | 10 |
| 102.1 | | 5 |
| 104.3 | | 0 |

## $C_{10}H_{15}BrO$
*d*-Bromocamphor

1640. (358)
B = $C_{10}H_{15}BrO$
*l*-Bromocamphor

| °C: Stable form | °C: Labile form | Mol % A |
|---|---|---|
| A | | |
| 75.0 | 45.0 | 100 |
| 72.6 | 45.5 | 95 |
| 70.0 | 46.0 | 90 |
| 64.1 | 47.2 | 80 |
| 57.5 | 48.2 | 70 |

1640.—(*Continued*)

| °C | Mol % A |
|---|---|
| A + AB | |
| 49.5E | 59 |
| AB | |
| **50.5** | **50** |
| AB + B | |
| 49.5E | 41 |
| B | |
| 57.5 | 30 |
| 64.1 | 20 |
| 70.0 | 10 |
| 72.6 | 5 |
| 75.0 | 0 |

1641. (351.5)
B = $C_{10}H_{16}O$
Camphor

| °C | Wt. % A |
|---|---|
| A | |
| 74.8 | 100 |
| 70.8 | 95 |
| 66.4 | 90 |
| A + B | |
| 62.3E | 85 |
| B | |
| 67.0 | 80 |
| 80.0 | 70 |
| 95.5 | 60 |
| 111.8 | 50 |
| 127.2 | 40 |
| 141.0 | 30 |
| 153.0 | 20 |
| 164.5 | 10 |
| 175.4 | 0 |

1642. (34)
B = $C_{13}H_{10}O_3$
Salol

| | |
|---|---|
| A | |
| 76.0 | 100 |
| A + B | |
| 21.0E | 40 |
| B | |
| 42.0 | 0 |

1643. (15)
B = $C_{57}H_{110}O_6$
Tristearin

| | |
|---|---|
| A | |
| 76.00 | 100.0 |
| 70.28 | 89.3 |
| 62.96 | 66.67 |
| 55.30 | 50.0 |
| A + B | |
| 48.7E | 33.33 |
| B | |
| 49.88 | 25.0 |
| 52.90 | 7.7 |
| 54.80 | 0.0 |

*v. also* 349, 1559, 1640

## $C_{10}H_{15}NO_2S$
1-Methyl-2-sulfone-amide-4-isopropyl-benzene

1644. *v.* p. 180
B = $C_{10}H_{15}NO_2S$
1-Methyl-3-sulfone-amide-4-isopropyl-benzene

## $C_{10}H_{16}$
Camphene
1645. (6)
B = $C_{10}H_{16}$
Dipentene

| °C | Mol % A |
|---|---|
| A | |
| 49.0 | 100 |
| + 22.0 | 90 |
| − 3.0 | 80 |
| − 38.0 | 70 |
| − 51.0 | 60 |
| − 74.0 | 50 |
| −100.0 | 40 |
| A + B | |
| −115.0E | 35 |
| B | |
| −111.0 | 30 |
| −104.0 | 20 |
| − 96.0 | 10 |
| − 89.0 | 0 |

1646. (6)
B = $C_{10}H_{16}$
*α*-Pinene

| | |
|---|---|
| A | |
| 49.0 | 100 |
| 34.0 | 90 |
| + 17.0 | 80 |
| − 1.0 | 70 |
| − 20.0 | 60 |
| − 41.0 | 50 |
| − 67.0 | 40 |
| A + B | |
| −125.0E | 29 |
| B | |
| −108.0 | 20 |
| − 99.0 | 10 |
| − 72.0 | 0 |

1647. (6)
B = $C_{10}H_{16}$
*β*-Pinene

| | |
|---|---|
| A | |
| 49.0 | 100 |
| 34.0 | 90 |
| + 17.0 | 80 |
| − 1.0 | 70 |
| − 20.0 | 60 |
| − 44.0 | 50 |
| − 73.0 | 40 |
| A + B | |
| −115.0E | 29 |
| B | |
| − 95.0 | 20 |
| − 75.0 | 10 |
| − 57.0 | 0 |

1648. (6)
B = $C_{10}H_{16}$
Turpentine

1648.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 49.0 | 100 |
| 30.0 | 90 |
| + 10.0 | 80 |
| − 9.0 | 70 |
| − 29.0 | 60 |
| − 51.0 | 50 |
| − 75.0 | 40 |
| A + B | |
| −101.0E | 30 |
| B | |
| − 85.0 | 20 |
| − 68.0 | 10 |
| − 52.0 | 0 |

1649. (99)
B = $C_{10}H_{16}O$
Camphor Mix.

| | |
|---|---|
| 49.3 | 100 |
| 59.4 | 90 |
| 70.9 | 80 |
| 83.0 | 70 |
| 95.4 | 60 |
| 108.9 | 50 |
| 122.0 | 40 |
| 135.8 | 30 |
| 149.3 | 20 |
| 163.6 | 10 |
| 178.0 | 0 |

1650. (99)
B = $C_{10}H_{17}Cl$
Pinene hydrochloride Mix.

| | |
|---|---|
| 49.3 | 100 |
| 52.8 | 90 |
| 56.4 | 80 |
| 60.0 | 70 |
| 64.0 | 60 |
| 69.3 | 50 |
| 78.0 | 40 |
| 88.4 | 30 |
| 99.8 | 20 |
| 111.8 | 10 |
| 123.0 | 0 |

1651. (99)
B = $C_{10}H_{18}O$
Borneol Mix.

| | |
|---|---|
| 49.3 | 100 |
| 61.3 | 90 |
| 76.0 | 80 |
| 92.3 | 70 |
| 110.0 | 60 |
| 128.7 | 50 |
| 145.0 | 40 |
| 161.0 | 30 |
| 177.7 | 20 |
| 194.0 | 10 |
| 207.0 | 0 |

1652. (281)
B = $C_{14}H_{10}$
Phenanthrene

1652.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 49.3 | 100 |
| A + B | |
| 13.5E | 90.16 |
| B | |
| 99.0 | 0 |

*v. also* 238, 1008, 1560

## $C_{10}H_{16}$
Dipentene
*v.* 1645

## $C_{10}H_{16}$
*α*-Pinene
*v.* 1646

## $C_{10}H_{16}$
*β*-Pinene
*v.* 1647

## $C_{10}H_{16}$
Turpentine
*v.* 1648

## $C_{10}H_{16}O$
Camphor
1653. (99)
B = $C_{10}H_{17}Cl$
Pinene hydrochloride Mix.

| | |
|---|---|
| 178.0 | 100 |
| 167.5 | 90 |
| 159.9 | 80 |
| 152.1 | 70 |
| 147.2 | 60 |
| 141.1 | 50 |
| 135.8 | 40 |
| 131.3 | 30 |
| 128.2 | 20 |
| 125.5 | 10 |
| 123.0 | 0 |

1654. (99)
B = $C_{10}H_{18}O$
Borneol Mix.

| | |
|---|---|
| 178.0 | 100 |
| 180.1 | 90 |
| 183.0 | 80 |
| 185.9 | 70 |
| 188.7 | 60 |
| 191.4 | 50 |
| 194.3 | 40 |
| 197.1 | 30 |
| 200.0 | 20 |
| 203.2 | 10 |
| 207.0 | 0 |

1655. (379)
B = $C_{10}H_{20}O$
Menthol

| | |
|---|---|
| A | |
| 175 | 100 |
| 155 | 92.64 |
| 142 | 88.54 |

1655.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 108 | 76.73 |
| 96 | 70.35 |
| 48 | 56.08 |
| 34.5 | 50.54 |
| 19 | 46.54 |
| B | |
| 22.5 | 25.43 |
| 34.5 | 13.71 |
| 39.6 | 5.56 |
| 43.0 | 0 |

1656. (34)
B = $C_{13}H_{10}O_3$
Salol

| °C | Wt. % A |
|---|---|
| A | |
| 178.0 | 100 |
| A + B | |
| 6.0E | 44 |
| B | |
| 42.0 | 0 |

1657. (101)
B = $C_{13}H_{12}N_2S$
Thiocarbanilide

| °C | Mol % A |
|---|---|
| A | |
| 178.0 | 100 |
| A + B | |
| 94.4E | 74.5 |
| B | |
| 150.2 | 0 |

1658. (101)
B = $C_{14}H_{10}$
Anthracene

| | |
|---|---|
| A | |
| 178.0 | 100 |
| A + B | |
| 116.5E | 80.5 |
| B | |
| 213.0 | 0 |

*v. also* 51.2, 214, 239, 309, 349.1, 381.1, 572, 616, 643, 683, 690, 696, 747, 785, 798, 887, 913, 939, 951, 952, 953, 1008.1, 1030, 1035, 1037, 1071, 1099, 1127, 1153, 1176, 1317, 1404, 1410, 1480, 1493, 1531, 1551, 1561, 1625, 1641, 1649

## $C_{10}H_{16}O$
Fenchone
*v.* 617, 786, 888, 940, 1072, 1100, 1128, 1154, 1177, 1580, 1592

## $C_{10}H_{16}O_4$
*d*-Camphoric acid
1659. (72)
B = $C_{10}H_{16}O_4$
*l*-Camphoric acid

| °C | Mol % A |
|---|---|
| A | |
| 171.8 | 100 |
| 169.7 | 95 |
| A + AB | |
| 167.5E | 90 |
| AB | |
| 177.0 | 80 |
| 184.3 | 70 |
| 188.2 | 60 |
| **189.8** | **50** |
| 188.2 | 40 |
| 184.3 | 30 |
| 177.0 | 20 |
| AB + B | |
| 167.5E | 10 |
| B | |
| 169.7 | 5 |
| 171.8 | 0 |

*v. also* 99, 350, 416

## $C_{10}H_{16}O_4$
*d*-Isocamphoric acid
1660. (72)
B = $C_{10}H_{16}O_4$
*l*-Isocamphoric acid

| | |
|---|---|
| A | |
| 171.8 | 100 |
| 169.7 | 95 |
| A + AB | |
| 167.5E | 90 |
| AB | |
| 177.0 | 80 |
| 184.3 | 70 |
| 188.2 | 60 |
| **189.8** | **50** |
| 188.2 | 40 |
| 184.3 | 30 |
| 177.0 | 20 |
| AB + B | |
| 167.5E | 10 |
| B | |
| 169.7 | 5 |
| 171.8 | 0 |

## $C_{10}H_{17}Cl$
Pinene hydrochloride
1661. (99)
B = $C_{10}H_{18}O$
Borneol Mix.

| | |
|---|---|
| 123.0 | 100 |
| 127.0 | 90 |
| 132.5 | 80 |
| 139.3 | 70 |
| 147.0 | 60 |
| 155.2 | 50 |
| 163.9 | 40 |
| 172.5 | 30 |
| 182.0 | 20 |

**$C_{10}H_{17}Cl$.—**
(*Continued*)

1661.—(*Continued*)

| °C | Mol % A |
|---|---|
| Mix. | |
| 192.8 | 10 |
| 207.0 | 0 |

*v. also* 1650, 1653

**$C_{10}H_{17}NO$**
*d*-Camphoroxime
1662. (1)
B = $C_{10}H_{17}NO$
*l*-Camphoroxime

| Mix. | |
|---|---|
| 118.8 | 100–0 |

**$C_{10}H_{18}O$**
Borneol
*v.* 1651, 1654, 1661

**$C_{10}H_{18}O$**
Cineole
1663. (36)
B = $C_{13}H_{10}O_3$
Salol

| °C | Wt. % A |
|---|---|
| A | |
| + 1.0 | 100 |
| A + B | |
| −13.0E | 68 |
| B | |
| +42.0 | 0 |

1664. (36)
B = $C_{17}H_{12}O_3$
Naphthyl salicylate

| A | |
|---|---|
| + 1.0 | 100 |
| A + B | |
| − 5.0E | 81.5 |
| B | |
| +90.0 | 0 |

*v. also* 889, 914, 941, 1073, 1101, 1129, 1155, 1214, 1224, 1411, 1414, 1416, 1469, 1511, 1581, 1593, 1636

**$C_{10}H_{18}O$**
Menthone
1665. (462)
B = $C_{10}H_{20}O$
Menthol

| Mix. | |
|---|---|
| − 6.6 | 100 |
| −12.0† | 75 |
| +39.0 | 0 |

**$C_{10}H_{20}O$**
Menthol
1666. (34)
B = $C_{13}H_{10}O_3$
Salol

1666.—(*Continued*)

| °C | Wt. % A |
|---|---|
| Mix. | |
| 41.9 | 100 |
| 35.0 | 90 |
| 32.5 | 80 |
| 30.0 | 70 |
| 28.5 | 60 |
| 28.0† | 55 |
| 28.0 | 40 |
| 28.5 | 30 |
| 30.5 | 20 |
| 34.5 | 10 |
| 42.0 | 0 |

*v. also* 234, 254, 470.05, 862, 1009, 1481, 1562, 1634, 1655, 1665

**$C_{11}H_{12}N_2O$**
Antipyrine
1667. (34)
B = $C_{13}H_{10}O_3$
Salol

| A | |
|---|---|
| 112.6 | 100 |
| 104.5 | 90 |
| 98.0 | 80 |
| 91.0 | 70 |
| 83.0 | 60 |
| 75.0 | 50 |
| 65.0 | 40 |
| 53.0 | 30 |
| A + B | |
| 30.0E | 17 |
| B | |
| 35.0 | 10 |
| 42.0 | 0 |

*v. also* 235, 787, 890, 915, 942, 1074, 1102, 1130, 1156, 1178, 1405, 1412, 1513, 1524, 1582, 1594

**$C_{11}H_{13}NO_4$**
*d*-Benzylamino-succinic acid
1668. (72)
B = $C_{11}H_{13}NO_4$
*l*-Benzylamino-succinic acid

| A | |
|---|---|
| 130.0 | 100 |
| 127.7 | 95 |
| 125.4 | 90 |
| A + AB | |
| 123.0E | 85 |
| AB | |
| 124.6 | 80 |
| 127.5 | 70 |
| 129.8 | 60 |
| **131.0** | **50** |
| 129.8 | 40 |
| 127.5 | 30 |
| 124.6 | 20 |

1668.—(*Continued*)

| °C | Wt. % A |
|---|---|
| AB + B | |
| 123.0E | 15 |
| B | |
| 125.4 | 10 |
| 127.7 | 5 |
| 130.0 | 0 |

**$C_{12}H_4N_6O_{12}S$**
Picryl sulfide
*v.* 1318, 1330

**$C_{12}H_5N_7O_{12}$**
Hexanitrodiphenylamine
*v.* 1319

**$C_{12}H_8$**
Acenaphthylene
*v.* 528, 618

**$C_{12}H_9Br$**
Bromoacenaphthene
1669. (83)
B = $C_{12}H_9Cl$
Chloroacenaphthene

| °C | Mol % A |
|---|---|
| Mix. | |
| 51.2 | 100 |
| 52.7 | 90 |
| 54.5 | 80 |
| 56.3 | 70 |
| 58.2 | 60 |
| 59.9 | 50 |
| 61.8 | 40 |
| 63.8 | 30 |
| 65.7 | 20 |
| 67.7 | 10 |
| 69.8 | 0 |

1670. (83)
B = $C_{12}H_9I$
Iodoacenaphthene

| A | |
|---|---|
| 51.2 | 100 |
| 47.4 | 90 |
| 43.3 | 80 |
| 39.1 | 70 |
| 34.8 | 60 |
| A + B | |
| 32.5E | 55.1 |
| B | |
| 35.9 | 50 |
| 42.1 | 40 |
| 47.4 | 30 |
| 52.4 | 20 |
| 57.2 | 10 |
| 62.0 | 0 |

1671. *v.* p. 180
B = $C_{12}H_{10}$
Acenaphthene

**$C_{12}H_9Cl$**
Chloroacenaphthene

1672. *v.* p. 180
B = $C_{12}H_9I$
Iodoacenaphthene

1673. *v.* p. 180
B = $C_{12}H_{10}$
Acenaphthene

*v. also* 1669

**$C_{12}H_9I$**
Iodoacenaphthene
1674. *v.* p. 180
B = $C_{12}H_{10}$
Acenaphthene

*v. also* 1670, 1672

**$C_{12}H_9N$**
Carbazole
1675. (370)
B = $C_{13}H_9N$
Acridine

| °C $t_L$ | °C $t_S$ | Wt. % A |
|---|---|---|
| 244.5 | | 100 |
| 237.0 | 234.0 | 90 |
| 229.0 | 222.0 | 80 |
| 220.0 | 208.0 | 70 |
| 207.0 | 189.0 | 60 |
| 192.0 | 167.0 | 50 |
| 172.0 | 142.0 | 40 |
| 146.0 | 123.0 | 30 |
| 108.0† | | 9 |
| 110.2 | | 0 |

1676. (122, 370, 475)
B = $C_{14}H_{10}$
Anthracene

| 245.6 | 100 |
|---|---|
| Mixed crystals | |
| 242.5 | 241.5 | 95 |
| 239.6 | 237.5 | 90 |
| 234.0 | 231.0 | 80 |
| 229.2 | 225.0 | 70 |
| 225.0 | 223.0 | 60 |
| 223U | | 54 |
| 221.2 | 220.3 | 40 |
| 219.5 | 219.4 | 30 |
| 218.0 | 218.0 | 20 |
| 216.5 | 216.5 | 10 |
| 216.0 | 216.0 | 5 |
| 216.5 | | 0 |

*v. also* 1882, 1883

1677. (122, 370, 475)
B = $C_{14}H_{10}$
Phenanthrene

| 245.6 | 100 |
|---|---|
| Mixed crystals | |
| 242.0 | 233.0 | 95 |
| 238.0 | 218.0 | 90 |
| 230.0 | 180.0 | 80 |
| 221.0 | 119.2 | 70 |
| 211.5 | 119.2 | 60 |
| 201.0 | 119.2 | 50 |
| 188.2 | 119.2 | 40 |
| 173.0 | 119.2 | 30 |

1677.—(*Continued*)

| °C $t_L$ | °C $t_S$ | Wt. % A |
|---|---|---|
| Mixed crystals | | |
| 151.5 | 119.2 | 20 |
| 119.2U | | 10 |
| 108.0 | 101.2 | 5 |
| 98.8 | | 0 |

*v. also* 1882

1678. *v.* p. 180
B = $C_{18}H_{12}$
Chrysene
*v. also* 1883

1679. (370)
B = $C_{18}H_{18}$
Retene

| °C | Wt. % A |
|---|---|
| A | |
| 244.5 | 100 |
| 239.0 | 90 |
| 233.0 | 80 |
| 226.0 | 70 |
| 217.0 | 60 |
| 208.0 | 50 |
| 196.0 | 40 |
| 182.0 | 30 |
| 165.0 | 20 |
| 135.0 | 10 |
| A + B | |
| 86.0E | *ca.* 3 |
| B | |
| 98.0 | 0 |

*v. also* 12, 28, 184, 285, 351, 381, 517, 573, 619, 722, 748, 765, 788, 828, 863, 891, 916, 943, 1010, 1103, 1130.1, 1157, 1179, 1206, 1320, 1355, 1447, 1583, 1595, 1882, 1883

**$C_{12}H_9NO_2$**
Nitroacenaphthene
*v.* 620, 644

**$C_{12}H_{10}$**
Acenaphthene
1680. *v.* p. 180
B = $C_{13}H_{10}$
Fluorene

1681. (379)
B = $C_{14}H_{10}O_2$
Benzil

| °C | Mol % A |
|---|---|
| A | |
| 95 | 100 |
| A + B | |
| 68.8E | 46.42 |
| B | |
| 98.5 | 0 |

1682. (133)
B = $C_{17}H_{14}O$
Cinnamylidene-acetophenone

| °C | Wt. % A |
|---|---|
| A | |
| 92.5 | 100 |
| A + B | |
| 67.0E | 43 |
| B | |
| 100.0 | 0 |

*v. also* 13, 29, 52, 100, 352, 382, 417, 471, 518, 529, 574, 621, 645, 723, 749, 766, 789, 800, 810, 829, 864, 892, 917, 944, 1207, 1301, 1321, 1356, 1366, 1373, 1380, 1448, 1496, 1512, 1529, 1671, 1673, 1674

**$C_{12}H_{10}$**
Diphenyl
*v.* 622, 646, 1011, 1285, 1563

**$C_{12}H_{10}N_2$**
Azobenzene
1686. *v.* p. 180
B = $C_{12}H_{10}N_2O$
Azoxybenzene

1687. *v.* p. 180
B = $C_{12}H_{12}N_2$
Hydrazobenzene

1688. (29, 373)
B = $C_{13}H_{11}N$
Benzalaniline
Mixed crystals

| 68.5 | 100 |
|---|---|
| 38.2E | 22.5 |
| 49.5 | 0 |

Mixtures containing from 35 to 13 Wt. % A freeze completely at 38.2°

1689. (189, 373)
B = $C_{13}H_{13}N$
Benzylaniline
Mixed crystals

| 68.5 | 100 |
|---|---|
| 25.0E | 23 |
| 36.5 | 0 |

Mixtures containing from 45 to 5 Wt. % A freeze completely at 25.0°

1690. (372)
B = $C_{14}H_{10}$
Tolane
Mix.

| 68.5 | 100 |
|---|---|
| 56.8† | 42 |
| 62.5 | 0 |

**1691.** (463)
**B = $C_{14}H_{10}O_2$**
Benzil

| °C | Mol % A |
|---|---|
| Mixed crystals | |
| 66.2 | 100 |
| 51.0E | 60.7 |
| 92.7 | 0 |

Mixtures containing from 57 to 42 Mol % A freeze completely at 51.0°

**1692.** (123, 372)
**B = $C_{14}H_{12}$**
Stilbene

| °C | % A |
|---|---|
| Mix. | |
| 68.5 | 100 |
| 124.0 | 0 |

**1693.** (463)
**B = $C_{14}H_{12}O_2$**
Benzoin

| °C | Mol % A |
|---|---|
| Mixed crystals | |
| 66.2 | 100 |
| 63.8E | 94.3 |
| 133.0 | 0 |

Mixtures containing 100 to 50 Mol % A freeze completely at 63.8°

**1694.** (29, 123, 372)
**B = $C_{14}H_{14}$**
Dibenzyl

| °C | Wt. % A |
|---|---|
| Mix. | |
| 68.5 | 100 |
| 48.0† | 30 |
| 52.5 | 0 |

**1695.** *v.* p. 181
**B = $C_{14}H_{14}N_2$**
*p*-Azotoluene

**1696.** (374)
**B = $C_{16}H_{12}N_2$**
Benzeneazonaphthalene

| Mixed crystals | |
|---|---|
| 68.5 | 100 |
| 59.7E | 72.5 |
| 131.0 | 0 |

Mixtures containing from 87 to 39 Wt. % A freeze completely at 59.7°

**1697.** (374)
**B = $C_{16}H_{16}O_2$**
*p*-Dimethoxystilbene

| A | |
|---|---|
| 68.5 | 100 |
| A + B | |
| 67.5E | 98.8 |
| B | |
| 212.0 | 0 |

**1698.** (133)
**B = $C_{17}H_{14}O$**
Cinnamylideneacetophenone

| °C | Wt. % A |
|---|---|
| A | |
| 67.0 | 100 |
| A + B | |
| 55.0E | 64 |
| B | |
| 100.0 | 0 |

**1699.** (374)
**B = $C_{26}H_{14}N_2$**
Azonaphthalene
Mixed crystals

| 68.5 | 100 |
|---|---|
| 67.3E | 87.5 |
| 186.6 | 0 |

Mixtures containing 100 to 75 Wt. % A freeze completely at 67.3°

*v. also* 101, 353, 418, 622.1, 789.1, 892.1, 917.1, 944.1, 1103.1, 1130.2, 1157.1, 1179.1, 1583.1, 1595.1

**$C_{12}H_{10}N_2O$**
Azoxybenzene
*v.* 1686

**$C_{12}H_{10}O$**
Diphenyl ether
**1700.** (365)
**B = $C_{12}H_{10}S$**
Diphenyl sulfide

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| +26.0 | 100 |
| −27.5E | 13.3 |
| −21.5 | 0 |

Mixtures containing from 47 to 4.5 Wt. % A freeze completely at −27.5°

*v. also* 575

**$C_{12}H_{10}O_2$**
α-Naphthyl acetate
*v.* 163

**$C_{12}H_{10}O_2$**
β-Naphthyl acetate
*v.* 164

**$C_{12}H_{10}S$**
Diphenyl sulfide
**1701.** (365)
**B = $C_{12}H_{10}Se$**
Diphenyl selenide

| °C | Wt. % A |
|---|---|
| Mix. | |
| −21.0 | 100 |
| −26.7† | 95 |
| + 2.5 | 0 |

**1702.** (365)
**B = $C_{12}H_{10}Te$**
Diphenyl telluride

| °C | Wt. % A |
|---|---|
| Mix. | |
| −21.0 | 100 |
| −30.7† | 83.5 |
| + 4.0 | 0 |

*v. also* 1700

**$C_{12}H_{10}Se$**
Diphenyl selenide
**1703.** (365)
**B = $C_{12}H_{10}Te$**
Diphenyl telluride

| Mix. | |
|---|---|
| +2.5 | 100 |
| −4.2† | 80.4 |
| +4.0 | 0 |

*v. also* 1701

**$C_{12}H_{10}Te$**
Diphenyl telluride
*v.* 1702, 1703

**$C_{12}H_{11}N$**
Diphenylamine
**1704.** (138)
**B = $C_{13}H_{10}O$**
Benzophenone

| °C | Wt. % A |
|---|---|
| A | |
| 53.1 | 100 |
| A + AB | |
| 28.7E | 63.5 |
| AB | |
| **30.85** | **48.1** |
| AB + B | |
| 24.0E | 28 |
| B | |
| 47.75 | 0 |

**1705.** (467)
**B = $C_{14}H_{10}$**
Anthracene

| °C | Mol % A |
|---|---|
| A | |
| 54 | 100.0 |
| B | |
| 147 | 66.7 |
| 165 | 50.0 |
| 180 | 33.3 |
| 213 | 0.0 |

**1706.** (42)
**B = $C_{14}H_{13}NO$**
Acetyldiphenylamine

| A | |
|---|---|
| 52.7 | 100 |
| A + B | |
| 14.3E | 62.5 |
| B | |
| 99.8 | 0 |

**1707.** (138)
**B = $C_{16}H_{34}O$**
*n*-Cetyl alcohol

**1707.**—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 53.1 | 100 |
| A + B | |
| 38.0E | 24.5 |
| B | |
| 46.3 | 0 |

**1708.** (136)
**B = $C_{17}H_{14}O$**
Cinnamylideneacetophenone

| A | |
|---|---|
| 52.5 | 100 |
| A + B | |
| 36.0E | *ca.* 59 |
| B | |
| 100.0 | 0 |

Author's belief in existence of compound probably due to supercooling

*v. also* 255, 399, 623, 700, 750, 790, 811, 842, 893, 918, 945, 1012, 1075, 1104, 1131, 1158, 1180, 1322, 1357, 1406, 1444, 1445, 1482, 1552, 1564, 1584, 1596, 1619

**$C_{12}H_{11}N_3$**
Aminoazobenzene
**1709.** (374)
**B = $C_{14}H_{12}$**
Stilbene

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| 142.0 | 100 |
| 96.0E | 62.5 |
| 124.0 | 0 |

Mixtures containing from 74 to 40 Wt. % A freeze completely at 96.0°

**$C_{12}H_{11}N_3$**
*p*-Aminoazobenzene
*v.* 1323

**$C_{12}H_{12}N_2$**
Hydrazobenzene
**1710.** (373)
**B = $C_{13}H_{11}N$**
Benzalaniline

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| 130.5 | 100 |
| 34.2E | 15 |
| 49.5 | 0 |

Mixtures containing from 47 to 8 Wt. % A freeze completely at 34.2°

**1711.** (373)
**B = $C_{13}H_{13}N$**
Benzylaniline

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| 130.5 | 100 |
| 33.0E | 19 |
| 36.0 | 0 |

Mixtures containing from 50 to 6 Wt. % A freeze completely at 33.0°

**1713.** (372)
**B = $C_{14}H_{10}$**
Tolane

| Mix. | |
|---|---|
| 130.5 | 100 |
| 49.8† | 17.5 |
| 62.5 | 0 |

**1714.** (372)
**B = $C_{14}H_{12}$**
Stilbene

| Mix. | |
|---|---|
| 130.5 | 100 |
| 93.0† | 52.25 |
| 123.5 | 0 |

**1715.** (463)
**B = $C_{14}H_{12}O_2$**
Benzoin

| °C | Mol % A |
|---|---|
| Mixed crystals | |
| 127.2 | 100 |
| 98.4E | 55.4 |
| 133.0 | 0 |

Mixtures containing from 80 to 20 Mol % A freeze completely at 98.4°

**1716.** (372)
**B = $C_{14}H_{14}$**
Dibenzyl

| °C | Wt. % A |
|---|---|
| Mix | |
| 130.5 | 100 |
| 45.9† | 13.8 |
| 52.5 | 0 |

*v. also* 1013, 1687

**$C_{12}H_{12}O$**
β-Naphthol ethyl ether
**1717.** (133)
**B = $C_{17}H_{14}O$**
Cinnamylideneacetophenone

| A | |
|---|---|
| 36.0 | 100 |
| A + B | |
| 29.5E | 76 |
| B | |
| 100.0 | 0 |

**$C_{12}H_{16}O_3$**
Isobutyl *d*-mandelate

**1718.** (72)
**B = $C_{12}H_{16}O_3$**
Isobutyl *l*-mandelate

| °C | Wt. % A |
|---|---|
| A | |
| 35.3 | 100 |
| 33.0 | 95 |
| A + AB | |
| 31.0E | 90.5 |
| AB | |
| 35.4 | 80 |
| 37.2 | 70 |
| 38.2 | 60 |
| **38.7** | **50** |
| 38.2 | 40 |
| 37.2 | 30 |
| 35.4 | 20 |
| AB + B | |
| 31.0E | 9.5 |
| B | |
| 33.0 | 5 |
| 35.3 | 0 |

**$C_{12}H_{18}O_8$**
Diethyl diacetyltartrate, *v.* 256, 865, 1076, 1442, 1565

**$C_{12}H_{24}O_2$**
Lauric acid
**1719.** (152)
**B = $C_{14}H_{28}O_2$**
Myristic acid

| A | |
|---|---|
| 43.6 | 100 |
| 41.3 | 90 |
| 38.5 | 80 |
| 35.2 | 70 |
| A + B | |
| 32.0E | 60 |
| B | |
| 37.4 | 50 |
| 43.0 | 40 |
| 46.7 | 30 |
| 49.6 | 20 |
| 51.8 | 10 |
| 53.8 | 0 |

**1720.** (152, 472)
**B = $C_{16}H_{32}O_2$**
Palmitic acid

| A | |
|---|---|
| 43.6 | 100 |
| 41.5 | 90 |
| 37.0 | 80 |
| A + B | |
| 34.5E | 75 |
| B | |
| 38.3 | 70 |
| 43.4 | 60 |
| 47.0 | 50 |
| 51.0 | 40 |
| 54.5 | 30 |
| 57.4 | 20 |
| 59.8 | 10 |
| 62.0 | 0 |

**$C_{12}H_{24}O_2$.—** (*Continued*)

1721. (152)
B = $C_{18}H_{36}O_2$
Stearic acid

| °C | Wt. % A |
|---|---|
| A | |
| 43.6 | 100 |
| 41.5 | 90 |
| A + B | |
| 37.0E | 77 |
| B | |
| 43.4 | 70 |
| 50.8 | 60 |
| 55.8 | 50 |
| 59.0 | 40 |
| 62.0 | 30 |
| 64.7 | 20 |
| 67.0 | 10 |
| 69.2 | 0 |

*v. also* 102, 354, 419, 473

**$C_{13}H_8N_2O_7$**
Di-(*o*-nitrophenyl) carbonate

1722. (159)
B = $C_{13}H_8N_2O_7$
Di-(*o*, *p*′-Nitrophenyl) carbonate

| °C | % A |
|---|---|
| A | |
| 112.6 | 100 |
| 110.0 | 94.0 |
| 100.0 | 73.6 |
| A + B | |
| 94.6E | 64.7 |
| B | |
| 100.0 | 57.8 |
| 110.0 | 43.6 |
| 120.0 | 25.0 |
| 130.1 | 0.0 |

*v. also* 1884

1723. (159)
B = $C_{13}H_8N_2O_7$
Di-(*p*-nitrophenyl) carbonate

| | |
|---|---|
| A | |
| 112.6 | 100 |
| 110.0 | 94.0 |
| 100.0 | 73.6 |
| A + B | |
| 95.4E | 65.8 |
| B | |
| 100.0 | 61.1 |
| 110.0 | 50.7 |
| 120.0 | 37.0 |
| 130.0 | 21.0 |
| 140.0 | 3.9 |
| 142.2 | 0.0 |

*v. also* 1884

**$C_{13}H_8N_2O_7$**
Di-(*o*-, *p*′-Nitrophenyl) carbonate

1724. (159)
B = $C_{13}H_8N_2O_7$
Di-(*p*-nitrophenyl) carbonate

| °C | % A |
|---|---|
| A | |
| 130.1 | 100 |
| 120.0 | 75.0 |
| 110.0 | 56.4 |
| A + B | |
| 107.5E | 52.5 |
| B | |
| 110.0 | 49.2 |
| 120.0 | 36.5 |
| 130.0 | 21.0 |
| 140.0 | 3.9 |
| 142.2 | 0.0 |

*v. also* 1722, 1884

**$C_{13}H_8N_2O_7$**
Di-(*p*-nitrophenyl) carbonate
*v.* 1723, 1724, 1884

**$C_{13}H_8O$**
Fluorenone
*v.* 576

**$C_{13}H_8O_2$**
Xanthone
*v.* 577

**$C_{13}H_9N$**
Acridine

1726. (370)
B = $C_{14}H_{10}$
Anthracene

| °C | Wt. % A |
|---|---|
| Mix. | |
| $t_L$ | $t_S$ |
| 110.2 | 110.2 | 100 |
| 109.5† | 109.5† | 92.3 |
| 138.0 | 109.5 | 80 |
| 156.0 | 131.0 | 70 |
| 170.0 | 149.0 | 60 |
| 181.0 | 164.0 | 50 |
| 191.0 | 177.0 | 40 |
| 199.0 | 188.0 | 30 |
| 206.0 | 199.0 | 20 |
| 209.0 | 203.0 | 10 |
| 216.5 | 216.5 | 0 |

1727. (370)
B = $C_{14}H_{10}$
Phenanthrene

| Mix. | | |
|---|---|---|
| 110.2 | 110.2 | 100 |
| 103.0 | | 90 |
| 94.0 | | 80 |
| 85.0 | | 70 |
| 76.0 | | 60 |
| 66.5† | 66.5 | 50 |
| 71.0 | 66.5 | 40 |
| 79.5 | 74.5 | 30 |
| 86.5 | 83.5 | 20 |
| 93.0 | 91.5 | 10 |
| 98.8 | | 0 |

1728. (370)
B = $C_{14}H_{11}N$
Methylacridine

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| 110.2 | 100 |
| 100.0 | 90 |
| 88.0 | 80 |
| 72.0 | 70 |
| 53U | *ca.* 55 |
| 72.0 | 25 |
| 76.0 | 20 |
| 83.0 | 10 |
| 90.5 | 0 |

*v. also* 1077, 1105, 1133, 1159, 1523, 1585, 1597, 1675

**$C_{13}H_{10}$**
Fluorene
*v.* 14, 103, 286, 355, 383, 519, 530, 578, 624, 647, 724, 751, 767, 791, 801, 812, 830, 866, 1014, 1208, 1324, 1358, 1367, 1374, 1381, 1449, 1516, 1530, 1566, 1680

**$C_{13}H_{10}ClNO$**
*o*-Chlorobenzanilide

1729. (215)
B = $C_{13}H_{10}ClNO$
*p*-Chlorobenzanilide

| °C | Mol % A |
|---|---|
| A | |
| 106.0 | 100 |
| A + B | |
| 91.5E | 90 |
| B | |
| 190.0 | 0 |

**$C_{13}H_{10}O$**
Benzophenone

1730. (217)
B = $C_{14}H_{14}N_2O_2$
*p*-Azoxyanisole

| °C | | Mol % A |
|---|---|---|
| Liquid crystals | Solid phase | |
| | A | |
| | 47.7 | 100 |
| | A + B | |
| | 42.2E | 93 |
| | B | |
| | 47.0 | 90 |
| | 62.5 | 80 |
| | 83.0 | 60 |
| | 95.5 | 40 |
| | 106.3 | 20 |
| | 110.4 | 10 |
| 115.5Trp. | | 7 |
| 122.0 | 112.7 | 4 |
| 135.0 | 114.0 | 0 |

*v. also* 104, 165, 625, 792, 894, 919, 946, 1078, 1106, 1134, 1160, 1181, 1483, 1586, 1598, 1620, 1626, 1637, 1704

**$C_{13}H_{10}O_2$**
Phenyl benzoate
*v.* 166

**$C_{13}H_{10}O_3$**
Salol
1731. *v.* p. 181
B = $C_{17}H_{12}O_3$
Betol

*v. also* 215, 230, 236, 400, 1470, 1489, 1599, 1638, 1642, 1656, 1663, 1666, 1667, 1877

**$C_{13}H_{11}N$**
Benzalaniline

1732. (463)
B = $C_{13}H_{11}NO$
Benzanilide

| °C | Mol % A |
|---|---|
| Mixed crystals | |
| 49.8 | 100 |
| 48.0E | 97 |
| 160.8 | 0 |

Mixtures containing from 100 to 40 Mol % A freeze completely at 48.0°

1733. (375)
B = $C_{13}H_{13}N$
Benzylaniline

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| 49.5 | 100 |
| 10.0E | 36.5 |
| 36.0 | 0 |

Mixtures containing from 53 to 29 Wt. % A freeze completely at 10.0°

1734. (373)
B = $C_{14}H_{10}$
Tolane

| | |
|---|---|
| Mixed crystals | |
| 49.5 | 100 |
| 36.0E | 72 |
| 62.5 | 0 |

Mixtures containing from 89 to 45 Wt. % A freeze completely at 36.0°

1735. (373)
B = $C_{14}H_{12}$
Stilbene

| | |
|---|---|
| Mixed crystals | |
| 49.5 | 100 |
| 45.0E | 92 |
| 123.5 | 0 |

Mixtures containing from 95 to 64.5 Wt. % A freeze completely at 45°

1736. (463)
B = $C_{14}H_{12}O_2$
Benzoin

| °C | Mol % A |
|---|---|
| Mixed crystals | |
| 49.8 | 100 |
| 47.0E | 94.7 |
| 133.0 | 0 |

Mixtures containing from 100 to 35 Mol % A freeze completely at 47.0°

1737. (363)
B = $C_{14}H_{13}NO$
Anisylideneaniline

| °C | Wt. % A |
|---|---|
| A | |
| 49.0 | 100 |
| A + $A_2B$ | |
| 27.5E | 70 |
| $A_2B$ | |
| **33.5** | **41** |
| $A_2B$ + B | |
| 25.5E | 40 |
| B | |
| 57.0 | 0 |

1738. (373)
B = $C_{14}H_{14}$
Dibenzyl

| | |
|---|---|
| Mixed crystals | |
| 49.5 | 100 |
| 30.2E | 72 |
| 52.5 | 0 |

Mixtures containing from 80 to 37 Wt. % A freeze completely at 30.2°

*v. also* 1688, 1710

**$C_{13}H_{11}NO$**
Benzanilide

1739. (463)
B = $C_{14}H_{10}O_2$
Benzil

| °C | Mol % A |
|---|---|
| Mixed crystals | |
| 160.8 | 100 |
| 87.4E | 14.5 |
| 93.6 | 0 |

Mixtures containing from 65 to 5 Mol % A freeze completely at 87.4°

1740. (463)
B = $C_{14}H_{12}O_2$
Benzoin

| | |
|---|---|
| Mixed crystals | |
| 160.8 | 100 |
| 116.6E | 36 |
| 133.0 | 0 |

Mixtures containing from 60 to 20 Mol % A freeze completely at 116.6°

*v. also* 1732

**$C_{13}H_{12}$**
Diphenylmethane
*v.* 626, 648, 920, 947, 1079, 1107, 1135, 1161, 1182, 1264, 1286, 1567, 1587, 1600, 1621, 1627

**$C_{13}H_{12}N_2S$**
Thiocarbanilide
*v.* 1657

**$C_{13}H_{12}O$**
Benzylphenol

1741. (373)
B = $C_{13}H_{13}N$
Benzylaniline

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| 38.5 | 100 |
| 17.0E | 44.5 |
| 36.0 | 0 |

Mixtures containing from 60 to 32 Wt. % A freeze completely at 17.0°

1742. (373)
B = $C_{14}H_{14}$
Dibenzyl

| | |
|---|---|
| Mixed crystals | |
| 38.5 | 100 |
| 23.8E | 70 |
| 52.5 | 0 |

Mixtures containing from 72.5 to 33 Wt. % A freeze completely at 23.8°

**$C_{13}H_{12}O$**
Benzhydrol
*v.* 626.1, 792.1, 894.1, 920.1, 947.1, 1015, 1080, 1107.1, 1135.1, 1161.1, 1182.1, 1239.1, 1264.1, 1525, 1587.1, 1600.1, 1621.1, 1627.1

**$C_{13}H_{13}N$**
Benzylaniline

1743. (373)
B = $C_{14}H_{16}$
Tolane

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| 36.0 | 100 |
| 27.0E | 62 |
| 62.5 | 0 |

Mixtures containing from 91 to 25 Wt. % A freeze completely at 27.0°

1744. (373)
B = $C_{14}H_{12}$
Stilbene

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| 36.0 | 100 |
| 32.0E | 95 |
| 123.5 | 0 |

Mixtures containing from 97.5 to 39 Wt. % A freeze completely at 32.0°

1745. (463)
B = $C_{14}H_{12}O_2$
Benzoin

| °C | Mol % A |
|---|---|
| Mixed crystals | |
| 34.2 | 100 |
| 32.4E | 97.8 |
| 132.7 | 0 |

Mixtures containing from 100 to 30 Mol % A freeze completely at 32.4°

1746. (373)
B = $C_{14}H_{14}$
Dibenzyl

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| 36.0 | 100 |
| 19.0E | 67.5 |
| 52.5 | 0 |

Mixtures containing from 76.5 to 47.5 Wt. % A freeze completely at 19.0°

*v. also* 1689, 1711, 1733, 1741

$C_{13}H_{13}N$
Diphenylmethylamine
*v.* 839, 1081

$C_{13}H_{13}O_3$
Phenyl salicylate
*v.* 167

$C_{13}H_{13}O_3P$
Methyldiphenoxyphosphine oxide
1747. (371)
B = $C_{18}H_{15}O_4P$
Triphenyl phosphate

| °C | Wt. % A |
|---|---|
| A | |
| 36.0 | 100 |
| A + B | |
| 22.5E | 59 |
| B | |
| 49.0 | 0 |

$C_{14}H_8O_2$
Anthraquinone
*v.* 53, 105, 185, 287, 356, 384, 504, 520, 867, 1016, 1209, 1450

$C_{14}H_{10}$
Anthracene
1748. (122, 370, 475)
B = $C_{14}H_{10}$
Phenanthrene

| °C | | Wt. % A |
|---|---|---|
| Mix. | | |
| $t_L$ | $t_S$ | |
| 216.5 | | 100 |
| 212.5 | 209.0 | 95 |
| 209.3 | 200.0 | 90 |
| 202.0 | 182.0 | 80 |
| 194.0 | 165.0 | 70 |
| 185.0 | 150.0 | 60 |
| 175.0 | 135.0 | 50 |
| 163.0 | 125.0 | 40 |
| 148.5 | 115.0 | 30 |
| 131.0 | 107.0 | 20 |
| 110.0 | 102.0 | 10 |
| 103.0 | 100.5 | 5 |
| 98.8 | 98.8 | 0 |

*v. also* 1882

1749. (370)
B = $C_{14}H_{11}N$
Methylacridine

| °C | Wt. % A |
|---|---|
| A | |
| 216.5 | 100 |
| 212.0 | 90 |
| 207.0 | 80 |
| 201.0 | 70 |
| 194.0 | 60 |
| 186.0 | 50 |
| 173.0 | 40 |
| 155.0 | 30 |
| 130.0 | 20 |
| 84.0E | *ca.* 8 |
| 90.5 | 0 |

1750. *v.* p. 181
B = $C_{18}H_{12}$
Chrysene
*v. also* 1883

1751. (370)
B = $C_{18}H_{18}$
Retene

| °C | | Wt. % A |
|---|---|---|
| $t_L$ | $t_S$ | |
| 216.5 | | 100 |
| 212.0 | 211.0 | 90 |
| 207.0 | 205.0 | 80 |
| 200.0 | 196.0 | 70 |
| 192.0 | 182.0 | 60 |
| 182.0 | 147.0 | 50 |
| 170.0 | 88.5 | 40 |
| 153.0 | 88.5 | 30 |
| 130.0 | 88.5 | 20 |
| 88.5E | | 8.5 |
| 93.0 | 88.5 | 5 |
| 98.0 | 98.0 | 0 |

*v. also* 15, 30, 106, 186, 288, 357, 385, 469, 521, 531, 579, 627, 649, 725, 752, 768, 793, 802, 813, 831, 868, 895, 921, 948, 1017, 1136, 1210, 1325, 1359, 1368, 1375, 1382, 1451, 1484, 1568, 1601, 1622, 1628, 1658, 1676, 1705, 1726, 1860, 1882, 1883

$C_{14}H_{10}$
Phenanthrene
1752. (370)
B = $C_{18}H_{12}$
Chrysene

| °C | | Wt. % A |
|---|---|---|
| $t_L$ | $t_S$ | |
| 98.8 | | 100 |
| 98.0 | 95.5 | 95 |
| 95.5† | | 87 |
| 114.0 | 95.5 | 80 |
| 142.0 | 121.0 | 70 |
| 166.0 | 151.0 | 60 |
| 185.0 | 175.0 | 50 |
| 202.0 | 195.0 | 40 |
| 217.0 | 211.0 | 30 |
| 230.5 | 227.0 | 20 |
| 242.0 | 240.0 | 10 |
| 252 5 | | 0 |

1753. (370)
B = $C_{18}H_{18}$
Retene

| °C | | Wt. % A |
|---|---|---|
| Mix. | | |
| $t_L$ | $t_S$ | |
| 98.8 | 98.8 | 100 |
| 92.0 | 90.0 | 90 |
| 83.5 | 81.0 | 80 |
| 73.0 | 69.0 | 70 |
| 61.0 | 58.0 | 60 |
| | 56.5† | 46 |
| 59.0 | 57.0 | 40 |
| 65.5 | 57.0 | 30 |
| 79.0 | 68.0 | 20 |
| 90.0 | 84.0 | 10 |
| 98.0 | | 0 |

*v. also* 16, 31, 54, 107, 112, 187, 289, 358, 386, 470, 505, 522, 532, 580, 628, 650, 726, 753, 769, 794, 803, 814, 832, 868.1, 1018, 1211, 1326, 1360, 1369, 1376, 1452, 1569, 1652, 1677, 1727, 1748, 1882

$C_{14}H_{10}$
Tolane
1754. (372)
B = $C_{14}H_{12}$
Stilbene

1754.—(*Continued*)

| °C | | Wt. % A |
|---|---|---|
| Mix. | | |
| $t_L$ | $t_S$ | |
| 62.5 | | 100 |
| 74.3 | 65.0 | 90 |
| 83.2 | 70.2 | 80 |
| 97.0 | 81.4 | 60 |
| 108.6 | 94.5 | 40 |
| 117.3 | 107.7 | 20 |
| 123.5 | | 0 |

1755. (372)
B = $C_{14}H_{14}$
Dibenzyl

| | | |
|---|---|---|
| Mix. | | |
| 62.5 | | 100 |
| 61.3 | 56.5 | 90 |
| 59.7 | 54.4 | 80 |
| 56.9 | 52 7 | 60 |
| 55.0 | 52.6 | 40 |
| 53.7 | 52.5 | 20 |
| 52.5 | | 0 |

*v. also* 1690, 1713, 1734, 1743

$C_{14}H_{10}O_2$
Benzil
1756. (463)
B = $C_{14}H_{12}$
Stilbene

| °C | Mol % A |
|---|---|
| Mixed crystals | |
| 94.0 | 100 |
| 87.3 | 90 |
| 81.2 | 80 |
| 76.6E | 71.5 |
| 85.5 | 60 |
| 93.0 | 50 |
| 100.0 | 40 |
| 106.0 | 30 |
| 111.2 | 20 |
| 116.0 | 10 |
| 120.4 | 0 |

Mixtures containing from 88 to 40 Mol % A freeze completely at 76.6°

1757. *v.* p. 181
B = $C_{14}H_{12}O_2$
Benzoin

1758. (463)
B = $C_{14}H_{14}$
Dibenzyl

| °C | Mol % B |
|---|---|
| 92.7 | 0 |
| 88.0 | 10 |
| 83.0 | 20 |
| 77.7 | 30 |
| 71.6 | 40 |
| 63.6 | 50 |
| 53.7 | 60 |
| 42.4 | 70 |
| 44.6 | 80 |
| 48.1 | 90 |
| 51.2 | 100 |

1759. (463)
B = $C_{14}H_{14}O_2$
Hydrobenzoin

| °C | Mol % A |
|---|---|
| Mixed crystals | |
| 93.5 | 100 |
| 89.2 | 90 |
| 85.8E | 82 |
| 95.4 | 70 |
| 103.0 | 60 |
| 109.8 | 50 |
| 115.2 | 40 |
| 120.1 | 30 |
| 124.8 | 20 |
| 129.6 | 10 |
| 133.7 | 0 |

Mixtures containing from 95 to 33 Mol % A freeze completely at 85.8°

*v. also* 168, 216, 358.1, 1018.1, 1407, 1681, 1691, 1739

$C_{14}H_{10}O_3$
Benzoic anhydride
*v.* 310, 1438

$C_{14}H_{11}N$
Methylacridine
*v.* 1728, 1749

$C_{14}H_{12}$
Stilbene
1760. (372)
B = $C_{14}H_{14}$
Dibenzyl

| °C | Wt. % A |
|---|---|
| Mix. | |
| $t_L$ | $t_S$ | |
| 123.5 | 123.5 | 100 |
| 121.0 | 114.5 | 90 |
| 117.0 | 105.0 | 80 |
| 113.0 | 96.0 | 70 |
| 108.0 | 87.0 | 60 |
| 102.0 | 80.0 | 50 |
| 95.0 | 73.0 | 40 |
| 85.5 | 66.0 | 30 |
| 75.0 | 59.5 | 20 |
| 64.0 | 54.5 | 10 |
| 52.5 | | 0 |

1761. (374)
B = $C_{14}H_{14}N_2$
Azotoluene

| °C | Wt. % A |
|---|---|
| Mix. | |
| 124.0 | 100 |
| 100.0† | 56 |
| 144.0 | 0 |

1762. (374)
B = $C_{16}H_{16}O_2$
*p*-Dimethoxystilbene

1762.—(*Continued*)

| °C | Wt. % A |
|---|---|
| Mix. | |
| 124.0 | 100 |
| 116.5† | 94 |
| 212.0 | 0 |

1763. (374)
B = $C_{20}H_{14}N_2$
Azonaphthalene

| | |
|---|---|
| Mixed crystals | |
| 123.5 | 100 |
| 112.5E | 70.5 |
| 186.6 | 0 |

Mixtures containing from 85 to 64 Wt. % A freeze completely at 112.5°

*v. also* 629, 651, 1692, 1709, 1714, 1735, 1744, 1754, 1756

$C_{14}H_{12}N_2$
Benzalazine
1764. (368)
B = $C_{14}H_{16}N_2$
Dibenzylhydrazine

| | |
|---|---|
| Mix. | |
| 92.0 | 100 |
| 38.0† | 16 |
| 47.0 | 0 |

1765. (368)
B = $C_{15}H_{13}N$
Cinnamylideneaniline

| | |
|---|---|
| Mix. | |
| 92.0 | 100 |
| 84.0† | 70 |
| 107.5 | 0 |

1766. (368)
B = $C_{16}H_{10}$
Diphenyldiacetylene

| | |
|---|---|
| Mix. | |
| 92.0 | 100 |
| 77.0† | 23.5 |
| 88.0 | 0 |

1767. (368)
B = $C_{16}H_{14}$
Diphenylbutadiene

| | |
|---|---|
| Mix. | |
| 92 | 100 |
| 148.4 | 0 |

1768. (368)
B = $C_{22}H_{16}N_2$
α-Naphtholazine

| | |
|---|---|
| Mixed crystals | |
| 92.0 | 100 |
| 80.0E | 68 |
| 152.0 | 0 |

Mixtures containing from 79 to 44 Wt. % A freeze completely at 80.0°

*v. also* 1576

### $C_{14}H_{12}O_2$
Benzoin
1769. (463)
B = $C_{14}H_{14}$
Dibenzyl

| °C | Mol % A |
|---|---|
| Mixed crystals | |
| 133.0 | 100 |
| 127.5 | 90 |
| 124.0 | 80 |
| 121.0 | 70 |
| 117.0 | 60 |
| 114.0 | 50 |
| 110.0 | 40 |
| 104.0 | 30 |
| 91.5 | 20 |
| 72.0 | 10 |
| 50.2E | 4 |
| 51.2 | 0 |

Mixtures containing from 60 to 0 Mol % A freeze completely at 50.2°

*v. also* 1693, 1715, 1736, 1740, 1745, 1757

### $C_{14}H_{12}O_2$
Phenyl anisyl ketone
*v.* 169

### $C_{14}H_{12}O_2$
Benzyl benzoate
*v.* 170

### $C_{14}H_{13}NO$
Acetyldiphenylamine
*v.* 1706

### $C_{14}H_{13}NO$
Anisylideneaniline
*v.* 1737

### $C_{14}H_{13}N_5O_4$
*m*-Nitrobenzenediazoethylamino-*p*-nitrobenzene
1770. (431)
B = $C_{14}H_{13}N_5O_4$
*p*-Nitrobenzenediazoethylamino-*m*-nitrobenzene

| °C | % A |
|---|---|
| Mix. | |
| 178.5 | 100 |
| 170.5 | 90 |
| 163.3 | 80 |
| 158.0 | 70 |
| 155.9† | 58 |
| 156.7 | 50 |
| 160.3 | 40 |
| 166.6 | 30 |
| 174.0 | 20 |
| 182.3 | 10 |
| 193.0 | 0 |

### $C_{14}H_{14}$
Dibenzyl
*v.* 630, 652, 1694, 1716, 1738, 1742, 1746, 1755, 1758, 1760, 1769

### $C_{14}H_{14}N_2$
Azotoluene
*v.* 1695, 1761

### $C_{14}H_{14}N_2O_2$
*p*-Azoanisole
1771. (45)
B = $C_{14}H_{14}N_2O_3$
*p*-Azoxyanisole

| °C | | Mol % A |
|---|---|---|
| Liquid crystals | Solid phase | |
| | A | |
| | 164.6 | 100 |
| | 160.2 | 90 |
| | 155.9 | 80 |
| | 151.2 | 70 |
| | 145.7 | 60 |
| | 139.2 | 50 |
| 124.4 | 131.6 | 40 |
| 126.0 | Trp. | 33.5 |
| 127.0 | 122.8 | 30 |
| | A + B | |
| 129.8 | 113.0E | 20 |
| | B | |
| 132.4 | 115.4 | 10 |
| 134.8 | 117.4 | 0 |

1772. (45)
B = $C_{15}H_{16}N_2O_2$
*p*-Azoanisolephenetole

| °C | | Mol % A |
|---|---|---|
| Liquid crystals | Solid phase | |
| | Mix. | |
| | 164.6 | 100 |
| | 159.0 | 90 |
| | 154.0 | 80 |
| | 148.8 | 70 |
| | 143.6 | 60 |
| | 139.0 | 50 |
| 124.0 | 135.0 | 40 |
| 126.0 | 133.0 | 30 |
| | 132.7† | 25 |
| 128.1 | 132.8 | 20 |
| 130.1 | 133.5 | 10 |
| 132.2 | 134.5 | 0 |

1773. (45)
B = $C_{16}H_{18}N_2O_2$
*p*-Azophenetole

| °C | | Mol % A |
|---|---|---|
| Liquid crystals | Solid phase | |
| | A | |
| | 164.6 | 100 |
| | 158.3 | 90 |
| | 151.9 | 80 |
| | 145.6 | 70 |
| 128.5 | 139.4 | 60 |
| | A + B | |
| 133.0 | 133.0E | 50 |
| | B | |
| 137.1 | 139.5 | 40 |
| 141.6 | 145.0 | 30 |
| 146.1 | 150.2 | 20 |
| 150.7 | 155.1 | 10 |
| 155.0 | 159.5 | 0 |

1773.1. (45)
B = $C_{16}H_{18}N_2O_2$
*p*-Methylpropylazophenol

| °C | Mol % A |
|---|---|
| Liquid crystals | |
| 109.9 | 100 |
| 109.6 | 90 |
| 109.1 | 80 |
| 109.1 | 70 |
| 109.2 | 60 |

### $C_{14}H_{14}N_2O_3$
*p*-Azoxyanisole
1774. (45)
B = $C_{15}H_{16}N_2O_2$
*p*-Azoanisolephenetole

| °C | | Mol % A |
|---|---|---|
| Liquid crystals | Solid phase | |
| | A | |
| 134.4 | 117.4 | 100 |
| 132.6 | 112.4 | 90 |
| 131.0 | 107.1 | 80 |
| | A + B | |
| | 102.5E | 71.5 |
| | B | |
| 130.0 | 103.5 | 70 |
| 129.8 | 109.7 | 60 |
| 129.7 | 115.4 | 50 |
| 129.5 | 120.4 | 40 |
| 129.7 | 124.5 | 30 |
| 130.0 | 128.4 | 20 |
| 130.8 | 131.8 | 10 |
| 132.2 | 134.5 | 0 |

1775. (390)
B = $C_{16}H_{18}N_2O_3$
*p*-Azoxyphenetole

| Liquid crystals $t_L$ | $t_S$ | Solid phase | Mol. % A |
|---|---|---|---|
| | | A | |
| 135.5 | | 118.5 | 100 |
| 137.8 | 137.2 | 114.4 | 90 |
| 140.5 | 140.1 | 109.5 | 80 |
| 143.2 | 142.8 | 103.9 | 70 |
| | | A + B | |
| | | 97.5E | 61.5 |
| | | B | |
| 146.3 | 145.8 | 99.0 | 60 |
| 149.6 | 149.2 | 107.7 | 50 |
| 152.8 | 152.4 | 115.2 | 40 |
| 156.3 | 155.9 | 122.1 | 30 |
| 159.7 | 159.3 | 128.4 | 20 |
| 163.2 | 162.8 | 133.8 | 10 |
| 167.3 | | 138.4 | 0 |

*v. also* 868.2, 1019, 1162, 1632, 1730, 1771

### $C_{14}H_{14}O_2$
Hydrobenzoin
*v.* 1759

### $C_{14}H_{16}N_2$
Hydrazotoluene
*v.* 1020

### $C_{14}H_{16}N_2$
Dibenzylhydrazine
1776. (368)
B = $C_{15}H_{13}N$
Cinnamylideneaniline

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| 47.0 | 100 |
| 35.5E | 95.5 |
| 107.5 | 0 |

Mixtures containing from 98 to 59 Wt. % A freeze completely at 35.5°

1777. (368)
B = $C_{16}H_{14}$
Diphenylbutadiene

| °C | Wt. % A |
|---|---|
| Mix. | |
| 47.0 | 100 |
| 148.4 | 0 |

*v. also* 1764

### $C_{14}H_{16}N_2O_2$
Hydrazoanisole
*v.* 1021

### $C_{14}H_{28}O_2$
Myristic acid
1778. (252)
B = $C_{16}H_{32}O_2$
Palmitic acid

| °C | Wt. % A |
|---|---|
| | A |
| 53.8 | 100 |
| 51.8 | 90 |
| 49.5 | 80 |
| 46.4 | 70 |
| A + B | |
| 43.5E | 62 |
| B | |
| 48.0 | 50 |
| 51.5 | 40 |
| 55.0 | 30 |
| 58.0 | 20 |
| 60.1 | 10 |
| 62.0 | 0 |

1779. (152)
B = $C_{18}H_{36}O_2$
Stearic acid

| | |
|---|---|
| A | |
| 53.8 | 100 |
| 50.7 | 90 |
| 47.8 | 80 |
| A + B | |
| 45.0E | 73 |
| B | |
| 50.7 | 60 |
| 55.0 | 50 |
| 59.1 | 40 |
| 62.5 | 30 |
| 65.0 | 20 |

1779.—(*Continued*)

| °C | Wt. % A |
|---|---|
| B | |
| 67.2 | 10 |
| 69.2 | 0 |

*v. also* 108, 359, 420, 474, 1719

### $C_{15}H_{13}N$
Cinnamylideneaniline
1780. (368)
B = $C_{16}H_{10}$
Diphenyldiacetylene

| | |
|---|---|
| Mix. | |
| 107.5 | 100 |
| 75.0† | 19 |
| 88.0 | 0 |

1781. (368)
B = $C_{16}H_{14}$
Diphenylbutadiene

| | |
|---|---|
| Mix. | |
| 107.5 | 100 |
| 148.5 | 0 |

*v. also* 1765, 1776

### $C_{15}H_{16}N_2O_2$
*p*-Azoanisolephenetole
1782. (45)
B = $C_{16}H_{18}N_2O_3$
*p*-Azoxyphenetole

| °C | | Mol % A |
|---|---|---|
| Liquid crystals | Solid phase | |
| | A | |
| 132.2 | 134.5 | 100 |
| 135.4 | 131.5 | 90 |
| 139.0 | 128.4 | 80 |
| 142.5 | 125.2 | 70 |
| 145.8 | 122.2 | 60 |
| 149.4 | 118.7 | 50 |
| | A + B | |
| | 118.0E | 48 |
| | B | |
| 152.8 | 121.6 | 40 |
| 156.3 | 126.1 | 30 |
| 159.8 | 130.3 | 20 |
| 163.5 | 134.0 | 10 |
| 167.5 | 136.9 | 0 |

1783. (45)
B = $C_{18}H_{22}N_2O_2$
*p*-Dipropylazophenol

| | |
|---|---|
| A | |
| 132.2 | 134.5 | 100 |
| 129.4 | 130.0 | 90 |
| 126.5 | 125.1 | 80 |
| 123.9 | 119.9 | 70 |
| 121.7 | 113.7 | 60 |
| A + B | | |
| | 113.0E | 59 |
| B | | |
| 119.8 | 119.8 | 50 |
| | 126.5 | 40 |
| | 132.3 | 30 |
| | 137.4 | 20 |
| | 141.9 | 10 |
| | 146.1 | 0 |

*v. also* 1772, 1774

### $C_{16}H_{10}$
Diphenyldiacetylene
1784. (368)
B = $C_{16}H_{14}$
Diphenylbutadiene

| °C | Wt. % A |
|---|---|
| Mix. | |
| 88.0 | 100 |
| 148.4 | 0 |

*v. also* 1766, 1780

### $C_{16}H_{11}N_3O_7$
Naphthalene picrate
1785. (334)
B = $C_{17}H_{13}N_3O_7$
Methylnaphthalene *β*-picrate

| °C | Wt. % A |
|---|---|
| Mix. | |
| 150.0 | 100 |
| 115.0 | 0 |

*v. also* 1022

### $C_{16}H_{12}N_2$
Benzeneazonaphthalene
*v.* 1696

### $C_{16}H_{14}$
Diphenylbutadiene
1786. (368)
B = $C_{19}H_{15}N$
Cinnamylidene-*β*-naphthylamine

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| 148.4 | 100 |
| 78.8E | 21.5 |
| 106.0 | 0 |

Mixtures containing from 68 to 13 Wt. % A freeze completely at 78.8°

*v. also* 1767, 1777, 1781, 1784

### $C_{16}H_{16}O_2$
*p*-Dimethoxystilbene
*v.* 1697, 1762

## $C_{16}H_{18}N_2O_2$
*p*-Azophenetole
1787. (45, 390)
B = $C_{16}H_{18}N_2O_3$
*p*-Azoxyphenetole

| °C Liquid mixed crystals $t_L$ | °C Solid mixed crystals $t_S$ | Mol % A |
|---|---|---|
| A | | |
| | 162.4 162.4 | 100 |
| | 161.0 160.2 | 95 |
| | 159.8 158.2 | 90 |
| | 158.7 156.0 | 85 |
| | 157.7 154.0 | 80 |
| A + B′ | | |
| 157.4E | 157.4E | 77 |
| B′ | | |
| 157.6 157.4 157.4 | 152.0 | 75 |
| 157.9 157.4 157.4 | 150.0 | 70 |
| 159.0 158.0 154.6 | 147.0 | 60 |
| 162.0 161.0 149.2 | 142.5 | 40 |
| 164.7 164.0 143.8 | 139.7 | 20 |
| 167.3 167.3 138.4 | 138.4 | 0 |

B′ = Liquid crystals

1788. (45)
B = $C_{18}H_{22}N_2O_2$
*p*-Dipropyl-azophenol

| °C Liquid crystals | °C Solid phase | Mol % A |
|---|---|---|
| A | | |
| 156.1 | 160.2 | 100 |
| 151.4 | 156.0 | 95 |
| 147.0 | 151.1 | 90 |
| 142.5 | 146.5 | 85 |
| 138.1 | 142.5 | 80 |
| 134.0 | 139.5 | 75 |
| 129.5 | 138.5 | 70 |
| | 139.6 | 60 |
| A + B | | |
| | 138.4E | 41.1 |
| B | | |
| | 143.5 | 20 |
| | 146.1 | 0 |

*v. also* 290, 1773

## $C_{16}H_{18}N_2O_2$
*p*-Methyl-propylazophenol
1790. (45)
B = $C_{17}H_{20}N_2O_2$
*p*-Ethyl-propylazophenol

| °C Liquid crystals | °C Solid phase | Mol % A |
|---|---|---|
| Mix. | | |
| 109.9 | 113.1 | 100 |
| 113.1 | 111.0† | 90 |
| 116.1 | 111.8 | 80 |
| 119.2 | 114.2 | 70 |
| 122.2 | 118.4 | 60 |
| 125.3 | 123.6 | 50 |
| 128.2 | 128.5 | 40 |
| 131.0 | 132.8 | 30 |
| 134.0 | 136.9 | 20 |
| 136.8 | 140.7 | 10 |
| 139.6 | 144.2 | 0 |

1791. (45)
B = $C_{18}H_{22}N_2O_2$
*p*-Dipropyl-azophenol

| °C Liquid crystals | Mol % A |
|---|---|
| 109.9 | 100 |
| 108.9 | 90 |
| 108.9 | 80 |
| 108.9 | 70 |

*v. also* 1773.1

## $C_{16}H_{18}N_2O_3$
*p*-Azoxyphenetole
1792. (390)
B = $C_{30}H_{50}O_2$
Cholesteryl propionate

| °C Liquid crystals $t_L$ | °C Liquid crystals $t_S$ | °C Solid phase $t_L$ | °C Solid phase $t_S$ | Mol % A |
|---|---|---|---|---|
| 167.3 | 167.3 | 138.4 | 138.4 | 100 |
| 157.2 | 156.6 | 135.0 | | 90 |
| 148.4 | 147.4 | 130.2 | 83.4 | 80 |
| 134.2 | 133.0 | 122.2 | 82.6 | 60 |
| 129.2 | 128.0 | 117.0 | 82.7 | 50 |
| 121.1 | 120.3 | 102.3 | 82.8 | 30 |
| 118.2 | 117.4 | 87.2 | 82.6 | 20 |
| | | 82.6E | | 17 |
| 115.2 | 114.4 | 88.4 | 82.8 | 10 |
| 112.4 | | 96.2 | | 0 |

1793. (390)
B = $C_{31}H_{52}O_2$
Cholesteryl isobutyrate

| | | | | |
|---|---|---|---|---|
| 167.3 | 167.3 | 138.4 | 138.4 | 100 |
| 161.0 | 159.2 | 136.4 | 136.4 | 95 |
| 145.2 | 142.6 | 130.4 | 106.4 | 80 |
| 115.2 | 114.2 | 122.2 | 106.4 | 60 |
| 115.2 | 114.2 | 112.2 | 106.4 | 40 |
| A + B | | A′ + B | | |
| | | 108.0E | | 32 |
| 110.0E | | | | 30 |
| B | | | | |
| 118.0 | | | | 20 |
| 124.8 | | | | 10 |
| 128.8 | | | | 0 |

A′ = Liquid crystals

1794. (390)
B = $C_{34}H_{50}O_2$
Cholesteryl benzoate

| | | | | |
|---|---|---|---|---|
| 167.3 | | 138.4 | | 100 |
| 162.0 | 161.0 | 134.5 | 112.0 | 90 |
| 157.1 | 156.0 | 130.0 | 111.5 | 80 |
| 156.0† | 156.0† | | | 73 |
| 157.3 | 157.3 | 121.8 | 112.5 | 60 |
| | | 112.5E | | 46 |
| 161.8 | 161.2 | 120.0 | 112.0 | 40 |
| 169.0 | 167.5 | 136.5 | 111.5 | 20 |
| 178.8 | | 149.5 | | 0 |

*v. also* 1633, 1775, 1782, 1787

## $C_{16}H_{32}O_2$
Palmitic acid
1795. (69)
B = $C_{18}H_{34}O_2$
Oleic acid

1795.—(*Continued*)

| °C | Wt. % A |
|---|---|
| Mix. | |
| 62.0 | 100.0 |
| 60.0 | 91.8 |
| 58.0 | 85.3 |
| 56.0 | 74.5 |
| 54.0 | 65.8 |
| 52.0 | 57.8 |
| 50.0 | 51.0 |
| 47.5 | 43.5 |
| 45.0 | 36.9 |
| 40.0 | 27.4 |
| 35.0 | 20.0 |
| 30.0 | 14.5 |
| 25.0 | 10.2 |
| 20.0 | 6.8 |
| 15.0 | 3.7 |
| 9.0 | 0.0 |

*v. also* 1885

1796. (69, 95.5, 152, 469)
B = $C_{18}H_{36}O_2$
Stearic acid

| | |
|---|---|
| A | |
| 62.0 | 100 |
| 60.0 | 92.0 |
| 58.0 | 83.1 |
| 56.0 | 74.5 |
| A + AB | |
| 54.9E | 70.0 |
| AB | |
| 56.0 | 59.5 |
| AB + B | |
| 56.5U | 48.0 |
| B | |
| 58.0 | 43.0 |
| 60.0 | 36.0 |
| 62.0 | 29.0 |
| 64.0 | 21.9 |
| 66.0 | 13.7 |
| 69.2 | 0.0 |

*v. also* 1885, 1886, 1887

1797. (332)
B = $C_{20}H_{40}O_2$
Arachidic acid

1798. (333)
B = $C_{24}H_{48}O_2$
Lignoceric acid

| °C $t_L$ | °C $t_S$ | Wt. % A |
|---|---|---|
| Mix. | | |
| 62.5 | 62.5 | 100 |
| 59.0 | 58.0 | 90 |
| 56.5† | 56.5† | 78 |
| 57.5 | 57.0 | 70 |
| 59.5 | 58.5 | 60 |
| 63.0 | 61.5 | 50 |
| 66.0 | 64.5 | 40 |
| 68.0 | 67.0 | 30 |
| 71.0 | 70.0 | 20 |
| 74.5 | 73.5 | 10 |
| 79.5 | 79.5 | 0 |

1799. *v.* p. 181
B = $C_{27}H_{46}O$
Cholesterol

1800. *v.* p. 181
B = $C_{51}H_{98}O_6$
Tripalmitin
*v. also* 1886, 1888

1801. (246.7)
B = $C_{57}H_{110}O_6$
Tristearin

| °C | Wt. % A |
|---|---|
| A | |
| 61.0 | 100 |
| 60.0 | 90 |
| 58.8 | 80 |
| 57.7 | 70 |
| 56.6 | 60 |
| A + AB | |
| 55.5E | 50 |
| AB | |
| 59.0 | 40 |
| 62.0 | 30 |
| **63.5** | **22.3** |
| AB + $AB_4$ | |
| 63.0E | 16 |
| $AB_4$ | |
| 67.7 | 10 |
| **68.4** | **6.7** |
| $AB_4$ + B | |
| 56E *ca.* | 0.5 |
| B | |
| 56.0 | 0 |

*v. also* 109, 360, 421, 475, 1720, 1778, 1885, 1886, 1887, 1888

## $C_{16}H_{34}O$
*n*-Cetyl alcohol
1802. (340)
B = $C_{27}H_{46}O$
Cholesterol

| °C | Mol % A |
|---|---|
| A | |
| 50.0 | 100 |
| A + AB | |
| 45.0E | 89 |
| AB + B | |
| 52.0U | 69 |
| B | |
| 148.0 | 0 |

The compound AB crystallizes in liquid crystals. The eut. A + B is therefore between solid crystals A and liquid crystals AB

*v. also* 217, 231, 361, 1707

## $C_{16}H_{37}NO_2$
Ammonium palmitate
*v.* 362

## $C_{17}H_{12}O_3$
Betol
*v.* 1731

## $C_{17}H_{12}O_3$
Naphthyl salicylate
*v.* 1664

## $C_{17}H_{13}N$
Benzylidene-α-naphthylamine
1803. (374)
B = $C_{17}H_{13}N$
Benzylidene-β-naphthylamine

| °C | Mol % A |
|---|---|
| Mixed crystals | |
| 73.0 | 100 |
| 47.5E | 61 |
| 103.0 | 0 |

Mixtures containing from 67 to 41 Mol % A freeze completely at 47.5°

## $C_{17}H_{13}N_3O_7$
Methylnaphthalene α-picrate
1804. (334)
B = $C_{17}H_{13}N_3O_7$
Methylnaphthalene β-picrate

| °C | % A |
|---|---|
| Mix. | |
| 141.0 | 100 |
| 115.0 | 0 |

## $C_{17}H_{13}N_3O_7$
Methylnaphthalene β-picrate
*v.* 1785, 1804

## $C_{17}H_{14}$
α-Benzyl-naphthalene
*v.* 631, 653

## $C_{17}H_{14}O$
Cinnamylidene-acetophenone
*v.* 1327, 1682, 1698, 1708, 1717

## $C_{17}H_{14}O$
Dibenzylacetone
*v.* 171, 218

## $C_{17}H_{16}O_3$
Eugenol benzoate
1805. (348)
B = $C_{17}H_{16}O_3$
Isoeugenol benzoate

| °C | Mol % A |
|---|---|
| A | |
| 69.5 | 100 |
| A + B | |
| 56.5E | 74.5 |
| B | |
| 104.0 | 0 |

## $C_{17}H_{17}NO$
*d*-Benzoyltetra-hydroquinaldine
1806. (1)
B = $C_{17}H_{17}NO$
*l*-Benzoyltetra-hydroquinaldine

| °C | Mol % A |
|---|---|
| A | |
| 119.4 | 100 |
| 119.2 | 95 |
| 119.0 | 90 |
| 118.5 | 80 |
| 118.0 | 70 |
| A + AB | |
| 117.8E | 65 |
| AB | |
| 118.2 | 60 |
| **119.2** | **50** |
| 118.2 | 40 |
| AB + B | |
| 117.8E | 36 |
| B | |
| 118.0 | 30 |
| 118.5 | 20 |
| 119.0 | 10 |
| 119.2 | 5 |
| 119.4 | 0 |

## $C_{17}H_{20}N_2O$
Tetramethyldiamino-benzophenone
*v.* 1526

## $C_{17}H_{20}N_2O_2$
*p*-Ethylpropyl-azophenol
*v.* 1790

## $C_{17}H_{22}N_2O$
Tetramethyl-diaminobenzhydrol
*v.* 1023

## $C_{18}H_{12}$
Chrysene
*v.* 1678, 1750, 1752, 1883

## $C_{18}H_{15}As$
Triphenylarsine
1807. (367)
B = $C_{18}H_{15}Bi$
Triphenyl-bismuthine

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| 59.0 | 100 |
| 40.0E | 72.5 |
| 76.0 | 0 |

Mixtures containing from 80 to 48 Wt. % A freeze completely at 40.0°

**$C_{18}H_{15}As$.—(*Continued*)**

1808. (367)
B = $C_{18}H_{15}N$
Triphenylamine

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| 59.0 | 100 |
| 45.5E | 76 |
| 127.5 | 0 |

Mixtures containing from 85 to 56 Wt. % A freeze completely at 45.5°

1809. (367)
B = $C_{18}H_{15}P$
Triphenylphosphine

| | |
|---|---|
| Mixed crystals | |
| 59.0 | 100 |
| 64.2U | 61.5 |
| 79.1 | 0 |

1810. (367)
B = $C_{18}H_{15}Sb$
Triphenylstibine

| | |
|---|---|
| Mix. | |
| 59.0 | 100 |
| 37.5† | 30 |
| 58.0 | 0 |

**$C_{18}H_{15}AsO$**
Triphenylarsine oxide
1811. (371)
B = $C_{18}H_{16}AsS$
Triphenylarsine sulfide

| | |
|---|---|
| Mix. | |
| 192.0 | 100 |
| 116.0† | 53 |
| 163.0 | 0 |

1812. (371)
B = $C_{18}H_{15}OP$
Triphenylphosphine oxide

| | |
|---|---|
| Mix. | |
| 192.0 | 100 |
| 153.5 | 0 |

1813. (371)
B = $C_{18}H_{15}SbS$
Triphenylstibine sulfide

| | |
|---|---|
| Mixed crystals | |
| 192.0 | 100 |
| 43.0E | 8 |
| 119.0 | 0 |

Mixtures containing from 55 to 0 Wt. % A freeze completely at 43.0°

**$C_{18}H_{15}AsS$**
Triphenylarsine sulfide

1814. (371)
B = $C_{18}H_{15}OP$
Triphenylphosphine oxide

| °C | Wt. % A |
|---|---|
| Mixed crystals | |
| 163.0 | 100 |
| 115.0E | 47 |
| 153.5 | 0 |

Mixtures containing 68 to 26 Wt. % A freeze completely at 115.0°

1815. (371)
B = $C_{18}H_{15}PS$
Triphenylphosphine sulfide

| | |
|---|---|
| Mix. | |
| 163.0 | 100 |
| 155.0† | 26 |
| 158.0 | 0 |

1816. (371)
B = $C_{18}H_{15}SbS$
Triphenylstibine sulfide

| | |
|---|---|
| Mix. | |
| 163.0 | 100 |
| 97.0† | 5 |
| 119.0 | 0 |

*v. also* 1811

**$C_{18}H_{15}Bi$**
Triphenylbismuthine
1817. (367)
B = $C_{18}H_{15}P$
Triphenylphosphine

| | |
|---|---|
| Mixed crystals | |
| 76.0 | 100 |
| 42.0E | 54 |
| 79.1 | 0 |

Mixtures containing from 66 to 44 Wt. % A freeze completely at 42°

*v. also* 1807

**$C_{18}H_{15}N$**
Triphenylamine
1818. (367)
B = $C_{18}H_{15}P$
Triphenylphosphine

| | |
|---|---|
| Mix. | |
| 127.5 | 100 |
| 63.5† | 25 |
| 79.1 | 0 |

*v. also* 1808

**$C_{18}H_{15}OP$**
Triphenylphosphine oxide
1819. (371)
B = $C_{18}H_{15}O_4P$
Triphenyl phosphate

1819.—(*Continued*)

| °C | Wt. % A |
|---|---|
| Mix. | |
| 153.5 | 100 |
| 47.5† | 6 |
| 49.0 | 0 |

1820. (371)
B = $C_{18}H_{15}PS$
Triphenylphosphine sulfide

| | |
|---|---|
| Mix. | |
| 153.5 | 100 |
| 122.0† | 38.5 |
| 158.0 | 0 |

1821. (371)
B = $C_{18}H_{15}SbS$
Triphenylstibine sulfide

| | |
|---|---|
| Mixed crystals | |
| 153.5 | 100 |
| 42E | 10 |
| 119.0 | 0 |

Mixtures containing from 78 to 0 Wt. % A freeze completely at 42°

*v. also* 1812, 1814

**$C_{18}H_{15}O_3PS$**
Triphenyl thiophosphate
1822. (371)
B = $C_{18}H_{15}O_4P$
Triphenyl phosphate

| | |
|---|---|
| Mix. | |
| 63.0 | 100 |
| 42.0† | 32 |
| 49.0 | 0 |

1823. (371)
B = $C_{18}H_{15}PS$
Triphenylphosphine sulfide

| | |
|---|---|
| Mixed crystals | |
| 63.0 | 100 |
| 56.0E | 87 |
| 158.0 | 0 |

Mixtures containing from 50 to 5 Wt. % A freeze completely at 56.0°

**$C_{18}H_{15}O_4P$**
Triphenyl phosphate
*v.* 1747, 1819, 1822

**$C_{18}H_{15}P$**
Triphenylphosphine
*v.* 1809, 1817, 1818

**$C_{18}H_{15}PS$**
Triphenylphosphine sulfide
1824. (371)
B = $C_{18}H_{15}SbS$
Triphenylstibine sulfide

1824.—(*Continued*)

| °C | Wt. % A |
|---|---|
| Mix. | |
| 158.0 | 100 |
| 82.0† | *ca.* 6 |
| 119.0 d. | 0 |

*v. also* 1272, 1815, 1820, 1823

**$C_{18}H_{15}SbS$**
Triphenylstibine sulfide
*v.* 1813, 1816, 1821, 1824

**$C_{18}H_{15}Sb$**
Triphenylstibine
*v.* 1810

**$C_{18}H_{18}$**
Retene
*v.* 533, 581, 632, 654, 804, 1328, 1679, 1751, 1753

**$C_{18}H_{18}N_2O_4$**
Ethyl *p*-azobenzoate
1825. (217)
B = $C_{18}H_{18}N_2O_5$
Ethyl *p*-azoxybenzoate

| °C | | Mol % A |
|---|---|---|
| Liquid crystals | Solid phase | |
| Mix. | | |
| | 143.1 | 100 |
| | 139.0 | 90 |
| | 133.0 | 80 |
| | 122.0 | 60 |
| | 115.5 | 40 |
| 114.6 Trp. | | 25 |
| 116.2 | 114.5 | 20 |
| 119.4 | 114.3 | 10 |
| 117.8 | 121.0 | 114.2 | 5 |
| 122.4 | 122.4 | 114.2 | 0 |

**$C_{18}H_{22}N_2O_2$**
*p*-Dipropyl-azophenol
*v.* 1783, 1788, 1791

**$C_{18}H_{34}O_2$**
Oleic acid
1826. (69, 117, 329)
B = $C_{18}H_{36}O_2$
Stearic acid

| °C | Wt. % A |
|---|---|
| A | |
| 9.0 | 100.0 |
| 20.0 | 95.2 |
| 25.0 | 92.2 |
| 30.0 | 90.0 |
| 35.0 | 85.9 |
| 40.0 | 81.9 |
| 45.0 | 74.5 |
| 47.5 | 70.5 |
| 50.0 | 66.1 |
| 52.0 | 62.5 |
| 54.0 | 51.8 |
| 56.0 | 52.8 |

1826.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 58.0 | 46.8 |
| 60.0 | 40.0 |
| 62.0 | 32.1 |
| 64.0 | 23.2 |
| 66.0 | 14.0 |
| 69.0 | 0.0 |

*v. also* 1885

1827. *v.* p. 181
B = $C_{27}H_{46}O$
Cholesterol

*v. also* 1795, 1885

**$C_{18}H_{36}O_2$**
Stearic acid
1828. (332)
B = $C_{20}H_{40}O_2$
Arachidic acid

| °C | | Wt. % A |
|---|---|---|
| $t_L$ | $t_S$ | |
| Mix. | | |
| 69.0 | 69.0 | 100 |
| 67.0 | 66.0 | 90 |
| 65.0 | 63.5 | 80 |
| 63.0 | 61.5 | 70 |
| 60.5† | 60.5† | 63 |
| 61.5 | 60.5 | 50 |
| 63.5 | 62.5 | 40 |
| 66.0 | 65.0 | 30 |
| 69.0 | 68.0 | 20 |
| 72.0 | 71.5 | 10 |
| 75.0 | 75.0 | 0 |

1829. (333)
B = $C_{24}H_{48}O_2$
Lignoceric acid

| | | |
|---|---|---|
| Mix. | | |
| 69.0 | 69.0 | 100 |
| 67.0 | | 90 |
| 65.0 | | 80 |
| 63.5† | 63.5† | 73 |
| 66.0 | 65.0 | 60 |
| 67.5 | 66.0 | 50 |
| 68.5 | 67.0 | 40 |
| 70.0 | 69.0 | 30 |
| 72.0 | 71.0 | 20 |
| 75.0 | 74.5 | 10 |
| 79.5 | 79.5 | 0 |

1830. *v.* p. 181
B = $C_{27}H_{46}O$
Cholesterol

1831. *v.* p. 181
B = $C_{51}H_{98}O_6$
Tripalmitin

*v. also* 1886, 1889

1832. (246.7)
B = $C_{57}H_{110}O_6$
Tristearin

| °C | Wt. % A |
|---|---|
| A | |
| 67.5 | 100 |
| 67.0 | 90 |
| 66.0 | 80 |

1832.—(*Continued*)

| °C | Wt. % A |
|---|---|
| A | |
| 64.5 | 70 |
| 62.7 | 60 |
| 61.1 | 50 |
| 59.5 | 40 |
| 57.8 | 30 |
| 56.0 | 20 |
| A + B | |
| 54.0E | 10 |
| B | |
| 56.0 | 0 |

*v. also* 363, 1570, 1721, 1779, 1796, 1826, 1885, 1886, 1887, 1889

**$C_{18}H_{37}NO_2$**
Ammonium oleate
*v.* 364

**$C_{18}H_{39}NO_2$**
Ammonium stearate
*v.* 364.1

**$C_{19}H_{13}N$**
5-Phenylacridine
*v.* 633

**$C_{19}H_{15}N$**
Cinnamylidene-β-naphthylamine
*v.* 1786

**$C_{19}H_{16}$**
Triphenylmethane
1833. *v.* p. 181
B = $C_{19}H_{16}O$
Triphenyl carbinol

1834. (294)
B = $C_{19}H_{17}N_3$
Triphenylguanidine

| | |
|---|---|
| A | |
| 90.0 | 100 |
| A + $B_s$ | |
| 81.0E | 80 |
| A + $B_m$ | |
| 78.8E | 77.5 |
| $B_m$ | |
| 138.0 | 0 |
| B | |
| 142.4 | 0 |

*v. also* 32, 430, 431, 437, 523, 634, 655, 815, 896, 922, 949, 1024, 1082, 1108, 1137, 1163, 1183, 1212, 1240, 1252, 1265, 1485, 1571, 1588, 1602, 1623, 1629

**$C_{19}H_{16}O$**
Triphenyl carbinol
*v.* 582, 635, 727, 754, 770, 816, 898, 923, 950, 1083, 1109,

1138, 1164, 1184, 1253, 1266, 1329, 1361, 1486, 1572, 1589, 1603, 1624, 1630, 1833, 1860

**$C_{19}H_{17}N_3$**
Triphenylguanidine
*v.* 311, 1495, 1834

**$C_{20}H_{14}N_2$**
Azonaphthalene
*v.* 1699, 1763

**$C_{20}H_{24}N_2O_2$**
Quinine, *v.* 1026

**$C_{20}H_{40}O_2$**
Arachidic acid
1835. (333)
B = $C_{24}H_{48}O_2$
Lignoceric acid

| °C | Wt. % A |
|---|---|
| Mix. | |
| 75.0 | 100 |
| 67.0† | 65 |
| 80.0 | 0 |

*v. also* 1797, 1828

**$C_{21}H_{21}N$**
Tribenzylamine
*v.* 1421

**$C_{22}H_{16}N_2$**
α-Naphtholazine
*v.* 1768

**$C_{22}H_{42}O_2$**
Brassidic acid
1836. (327)
B = $C_{22}H_{42}O_2$
Erucic acid

| °C | % A |
|---|---|
| A | |
| 58.3 | 100 |
| A + B | |
| 31.7E | 17.0 |
| B | |
| 33.3 | 0 |

1837. (327)
B = $C_{22}H_{42}O_2$
Isoerucic acid
Mixed crystals

| | |
|---|---|
| 58.3 | 100 |
| 52U | 45 |
| 51.5 | 0 |

1838. (327)
B = $C_{22}H_{44}O_2$
Behenic acid
Mixed crystals

| | |
|---|---|
| 58.3 | 100 |
| 57.2E | 91 |
| 79.2 | 0 |

**$C_{22}H_{42}O_2$**
Erucic acid

1839. (327)
B = $C_{22}H_{42}O_2$
Isoerucic acid

| °C | Wt. % A |
|---|---|
| A | |
| 33.3 | 100 |
| A + B | |
| 29.7 | 78 |
| B | |
| 51.2 | 0 |

1840. (327)
B = $C_{22}H_{44}O_2$
Behenic acid

| | |
|---|---|
| A | |
| 33.34 | 100 |
| A + B | |
| 33.1E | 96 |
| B | |
| 79.25 | 0 |

*v. also* 1836

**$C_{22}H_{42}O_2$**
Isoerucic acid
1841. (327)
B = $C_{22}H_{44}O_2$
Behenic acid

| °C | % A |
|---|---|
| Mix. | |
| 51.5 | 100 |
| 79.2 | 0 |

*v. also* 1837, 1839

**$C_{22}H_{44}O_2$**
Behenic acid
1842. (333)
B = $C_{22}H_{44}O_2$
Isobehenic acid
Mix.

| | |
|---|---|
| 84.0 | 100 |
| 75.0 | 0 |

*v. also* 1838, 1840, 1841

**$C_{23}H_{46}O_2$**
Methyl behenate
1843. (333)
B = $C_{23}H_{46}O_2$
Methyl isobehenate
Mix.

| | |
|---|---|
| 55.0 | 100 |
| 52.5† | 8 |
| 54.0 | 0 |

**$C_{24}H_{47}BrO_2$**
α-Bromotetracosanic acid
1844. (333)
B = $C_{24}H_{47}BrO_2$
α-Bromolignoceric acid
Mix.

| | |
|---|---|
| 73.5 | 100 |
| 67.0† | 10 |
| 68.5 | 0 |

**$C_{24}H_{48}O_2$**
Tetracosanic acid

1845. (333)
B = $C_{24}H_{48}O_2$
Lignoceric acid

| °C | Mol % A |
|---|---|
| Mix. | |
| 85.5–86 | 100 |
| 78.5† | 10 |
| 79.5–80 | 0 |

**$C_{24}H_{48}O_2$**
Lignoceric acid
*v.* 1798, 1829, 1835, 1845

**$C_{25}H_{50}O_2$**
Methyl tetracosanate
1846. (333)
B = $C_{25}H_{50}O_2$
Methyl lignocerate
Mix.

| | |
|---|---|
| 59.5–60.0 | 100 |
| 56.0† | 15 |
| 57.0–57.5 | 0 |

**$C_{27}H_{46}O$**
Cholesterol
*v.* 1799, 1802, 1827, 1830

**$C_{29}H_{48}O_2$**
Cholesteryl acetate
1847. (199)
B = $C_{29}H_{48}O_2$
α-Phytosteryl acetate
Mix.

| | |
|---|---|
| 113.6 | 100 |
| 128.3† | *ca.* 30 |
| 127.1 | 0 |

1848. (199)
B = $C_{29}H_{48}O_2$
β-Phytosteryl acetate
Mix.

| | |
|---|---|
| 113.6 | 100 |
| 141.2 | 0 |

**$C_{29}H_{48}O_2$**
α-Phytosteryl acetate
*v.* 1847

**$C_{29}H_{48}O_2$**
β-Phytosteryl acetate
*v.* 1848

**$C_{30}H_{50}O_2$**
Cholesteryl propionate
*v.* 1792

**$C_{31}H_{52}O_2$**
Cholesteryl isobutyrate
*v.* 1793

**$C_{32}H_{64}O_2$**
Cetyl palmitate
*v.* 1573

**$C_{34}H_{50}O_2$**
Cholesteryl benzoate
*v.* 1794

**$C_{51}H_{98}O_6$**
Tripalmitin
1849. (261.5)
B = $C_{57}H_{104}O_6$
Triolein

| °C | Wt. % A |
|---|---|
| Mix. | |
| 62.6 | 100 |
| 62.0 | 90 |
| 60.0 | 64.5 |
| 58.0 | 52.0 |
| 56.0 | 43.3 |
| 54.0 | 36.0 |
| 52.0 | 30.2 |
| 50.0 | 26.0 |
| 45.0 | 18.7 |
| 40.0 | 14.3 |
| 30.0 | 8.2 |
| 20.0 | 4.8 |
| +10.0 | 2.5 |
| − 7.0 | 0.0 |

*v. also* 1890

1850. (261.5)
B = $C_{57}H_{110}O_6$
Tristearin

| °C | Wt. % A |
|---|---|
| Mix. | |
| 62.6 | 100 |
| 62.0 | 98.0 |
| 60.0 | 91.0 |
| 58.0 | 84.0 |
| 56.0 | 75.5 |
| | 40.0 |
| 58.0 | 26.0 |
| 60.0 | 14.0 |
| | 7.0 |
| 58.0 | 3.0 |
| 56.0 | 0.0 |

*v. also* 1800, 1831, 1886, 1888, 1889, 1890

**$C_{57}H_{104}O_6$**
Triolein
1851. (261.5)
B = $C_{57}H_{110}O_6$
Tristearin
Mix.

| | |
|---|---|
| − 7.0 | 100 |
| +10.0 | 98.5 |
| 20.0 | 97.0 |

1851.—(*Continued*)

| °C | Wt. % A |
|---|---|
| Mix. | |
| 30.0 | 94.5 |
| 40.0 | 89.5 |
| 45.0 | 84.5 |
| 50.0 | 79.0 |
| 52.0 | 76.2 |
| 54.0 | 71.8 |
| 56.0 | 68.8 |
| 58.0 | 64.2 |
| 60.0 | 59.5 |
| 62.0 | 54.5 |
| 64.0 | 48.0 |
| 65.0 | 43.0 |
| | 31.0 |
| 64.0 | 24.0 |
| 62.0 | 16.0 |
| 60.0 | 10.0 |
| 58.0 | 5.0 |
| 56.0 | 0 |

*v. also* 1849, 1890

**$C_{57}H_{110}O_6$**
Tristearin
*v.* 1574, 1643, 1801, 1832, 1850, 1851, 1887, 1888, 1889, 1890

## PART II

### THREE-COMPONENT SYSTEMS

1852. $C_2H_5NO$, Acetamide; B = $C_2H_6O$, Ethyl alcohol; C = $C_6H_6O$, Phenol (267, 436).

Isothermal Compositions in Wt. % B

| Solvent | 75% A + 25% C | 50% A + 50% C | 40% A + 60% C | 25% A + 75% C | 6% A + 94% C |
|---|---|---|---|---|---|
| Solid phase | A | A | $AC_2$ | $AC_2$ | C |
| 60 °C | 3.0 | | | | |
| 50 | 15.5 | | | | |
| 40 | 27.0 | | | 0.7 | |
| 30 | 38.0 | 5.5 | 2.8 | 9.7 | 0.7 |
| 20 | 49.5 | 19.0 | 10.5 | 19.0 | 6.0 |
| 10 | 60.6 | 32.2 | 18.7 | 28.5 | 17.0 |

*v. also* 298, 323.1; Eq. 292, p. 174.

1853. $C_6H_3Cl_3$, 1, 2, 3-Trichlorobenzene; B = $C_6H_3Cl_3$, 1, 2,-4-Trichlorobenzene; C = $C_6H_3Cl_3$, 1, 3, 5-Trichlorobenzene (303).

Isothermal Compositions in % of Solid Phase

| Solvent | A + B, A + C, or A + (B + C) | B + C, B + A, or B + (C + A) | C + A, C + B, or C + (A + B) |
|---|---|---|---|
| Solid phase | A | B | C |
| 0.0 °C | 27.8 | 64.2 | 24.0 |
| 10.0 | 37.8 | 84.8 | 31.4 |
| 20.0 | 49.5 | | 40.4 |
| 30.0 | 62.7 | | 51.4 |
| 40.0 | 77.9 | | 64.0 |
| 50.0 | 95.3 | | 78 6 |
| 60.0 | | | 95.7 |

−5.0°E at 23% A, 56.5% B, 20.5% C.
M. P.: A, 52.4°; B, 16.6°; C, 62.7°.

1853.—(*Continued*)

Binary eutectics: A + B, 2.6° at 69.0% B.
A + C, 24.5° at 44.8% C.
B + C, 4.6° at 27.5% C.

1854. $C_6H_4BrCl$, *o*-Bromochlorobenzene; B = $C_6H_4BrCl$, *m*-Bromochlorobenzene; C = $C_6H_4BrCl$, *p*-Bromochlorobenzene (181).

| Solvent = 86.7% A + 13.3% C | |
|---|---|
| °C | % B |
| −18.6E | 0.0 |
| −20.7 | 5.0 |
| −23.0 | 10.0 |
| −25.3 | 15.0 |
| −27.7 | 20.0 |

*v. also* Eq. 656.

1855. $C_6H_4BrCl$, *p*-Bromochlorobenzene; B = $C_6H_4Br_2$, *p*-Dibromobenzene; C = $C_6H_4Cl_2$, *p*-Dichlorobenzene (59, 60, 277).

Isothermal Compositions in Mol % B

| Solvent | 20% A + 80% C | 50% A + 50% C | 80% A + 20% C |
|---|---|---|---|
| 85 °C | 93.2 | 92.6 | 91.5 |
| 82.5 | 85.2 | 83.1 | 80.5 |
| 80.0 | 78.2 | 74.8 | 70.0 |
| 77.5 | 71.0 | 66.0 | 59.5 |
| 75.0 | 64.3 | 58.0 | 49.0 |
| 72.5 | 57.2 | 49.5 | 38.5 |
| 70.0 | 50.5 | 40.8 | 27.7 |
| 67.5 | 43.7 | 32.0 | 16.7 |
| 65.0 | 36.8 | 22.2 | 4.4 |
| 62.5 | 29.2 | 12.4 | |
| 60.0 | 20.8 | 4.8 | |
| 57.5 | 13.0 | | |
| 55.0 | 6.0 | | |

*v. also* 657, 658, 675.

1856. $C_6H_4Br_2$, *o*-Dibromobenzene; B = $C_6H_4Br_2$, *m*-Dibromobenzene; C = $C_6H_4Br_2$, *p*-Dibromobenzene (181).

| Solvent = 87.0% A + 13.0% C | |
|---|---|
| °C | % B |
| +0.3E | 0.0 |
| −1.3 | 5.0 |
| −3.8 | 10.0 |
| −6.7 | 15.0 |

*v. also* Eq. 672.

1857. $C_6H_4Cl_2$, *o*-Dichlorobenzene; B = $C_6H_4Cl_2$, *m*-Dichlorobenzene; C = $C_6H_4Cl_2$, *p*-Dichlorobenzene (181).

| Solvent = 86.7% A + 13.3% C | |
|---|---|
| °C | % B |
| −23.4E | 0.0 |
| −25.2 | 5.0 |
| −27.1 | 10.0 |
| −29.1 | 15.0 |
| −31.2 | 20.0 |

*v. also* Eq. 701.

1858. $C_6H_4Cl_2O_4S_2$, *m*-Benzenedisulfonyl chloride; B = $C_7H_4Cl_2O_3S$, *sym*-Chloride of *m*-sulfobenzoic acid; C = $C_7H_4Cl_2O_3S$, *sym*-Chloride of *p*-sulfobenzoic acid (308).

| Solvent = 74% B + 26% C | |
|---|---|
| °C | % A |
| 8.4E | 0 |
| 5.0 | 7.1 |
| 10.0 | 5.6 |
| 15.0 | 4.0 |

*v. also* 704, Eq. 1280.

1859. $C_6H_4Cl_2O_4S_2$, *p*-Benzenedisulfonyl chloride.

B = $C_7H_4Cl_2O_3S$, *sym*-Chloride of *m*-sulfobenzoic acid; C = $C_7H_4Cl_2O_3S$, *sym*-Chloride of *p*-sulfobenzoic acid (308).

| Solvent = 74% B + 26% C | |
|---|---|
| °C | % A |
| 8.4E | 0.0 |
| 6.6 | 5.0 |
| 4.9 | 10.0 |
| 3.1 | 15.0 |

*v. also* 705, Eq. 1280.

1860. $C_6H_4O_2$, *p*-Quinone; **B = x; C = $C_6H_5NO_2$**, Nitrobenzene (266).

Where x = picric acid, dinitrophenol, *o*-, *m*-, and *p*-nitrophenol, phenol, catechol, resorcinol, quinol, pyrogallol, *p*-toluidine, *α*- and *β*-naphthol, *α*- and *β*-naphthylamine, anthracene, and triphenyl carbinol. The nitrobenzene acts only as a diluent to decrease the speed of the secondary reactions occurring between the other substances. These systems are therefore pseudobinary.

*v. also* 805, 806, 808, 813, 816.

1861. $C_6H_5NO_3$, *o*-Nitrophenol; B = $C_6H_5NO_3$, *m*-Nitrophenol; C = $C_6H_5NO_3$, *p*-Nitrophenol (71).

Isothermal Compositions in % of Solid Phase

| Solvent | 50% B + 50% C | 50% A + 50% C | 50% A + 50% B |
|---|---|---|---|
| Solid phase | A | B | C |
| 110.0 °C | | | 94.2 |
| 100.0 | | | 81.7 |
| 90.0 | | 93.7 | 70.6 |
| 80.0 | | 78.7 | 60.3 |
| 70.0 | | 64.9 | 51.0 |
| 60.0 | | 53.0 | 43.0 |
| 50.0 | | 45.0 | 36.6 |
| 40.0 | 89.9 | | 30.7 |
| 35.0 | 79.2 | | |
| 30.0 | 68.9 | | |

21.5°E at 57.7% A, 23.2% B, 19.1% C.

*v. also* Eq. 869, 870, 899.

1862. $C_6H_6N_2O_2$, *o*-Nitroaniline; B = $C_6H_6N_2O_2$, *m*-Nitroaniline; C = $C_6H_6N_2O_2$, *p*-Nitroaniline (180, 236, 304, 351, 461).

Isothermal Compositions in % of Solid Phase

| Solvent | A + B, A + C, or A + (B + C) | B + C, B + A, or B + (C + A) | C + A, C + B, or C + (A + B) |
|---|---|---|---|
| Solid phase | A | B | C |
| 140.0 °C | | | 88.7 |
| 130.0 | | | 75.9 |
| 120.0 | | | 65.0 |
| 110.0 | | 96.1 | 55.3 |
| 100.0 | | 79.8 | 46.5 |
| 90.0 | | 65.8 | 38.9 |
| 80.0 | | 53.4 | 31.9 |
| 70.0 | | 43.0 | 26.0 |
| 60.0 | 88.0 | 34.0 | 21.0 |
| 50.0 | 75.0 | 26.0 | 16.3 |

43.3°E at 67.0% A, 20.0% B, 13.0% C.
M. P.: A, 68.9°; B, 112.4°; C, 148.2°.
Binary eutectics: A + B, 50.0° at 25.5% B.
A + C, 55.0° at 18.6% C.
B + C, 88.0° at 37.0% C.

1863. $C_6H_6O$, Phenol; B = $C_7H_8O$, *m*-Cresol; C = $C_7H_8O$, *p*-Cresol (90, 118, 454).

Isothermal Compositions in Wt. % A

| Solvent | 80 % B + 20 % C | 50 % B + 50 % C | 20 % B + 80 % C |
|---|---|---|---|
| Solid phase | A | A | A |
| 40.0 °C | 99.0 | 99.1 | 99.1 |
| 38.0 | 95.3 | 95.7 | 96.0 |
| 36.0 | 91.3 | 92.3 | 92.9 |
| 34.0 | 87.3 | 88.6 | 89.6 |
| 32.0 | 83.6 | 85.5 | 86.8 |
| 30.0 | 80.1 | 82.4 | 83.8 |
| 28.0 | 76.3 | 79.0 | 80.8 |
| 26.0 | 72 5 | 76.0 | 78.2 |
| 24.0 | 68.6 | 72.7 | 75.3 |
| 22.0 | 64.8 | 69.8 | 72.6 |
| 20.0 | 61.2 | 66.7 | 70.0 |
| 18.0 | | 64.0 | 67.5 |
| 16.0 | | 61.3 | 64.9 |
| 15.0 | | | 62.7 |

*v. also* 1055, 1056, 1456.

1864. $C_6H_6O_2$, Catechol; B = $C_6H_6O_2$, Resorcinol; C = $C_6H_6O_2$, Hydroquinol (195, 420).

Isothermal Compositions in % of Solid Phase

| Solvent | 70 % B + 30 % C | 67 % A + 33 % C | 47 % A + 53 % B |
|---|---|---|---|
| Solid phase | A | B | C |
| 160 °C | | | 80.3 |
| 150 | | | 63.6 |
| 140 | | | 52.0 |
| 130 | | | 44.5 |
| 120 | | | 39.0 |
| 110 | | | 34.4 |
| 100 | 94.3 | 84.2 | 30.6 |
| 90 | 78.8 | 73.3 | 27.2 |
| 80 | 65.0 | 64.8 | 24.5 |
| 70 | 53.5 | 57.3 | 22.5 |
| 60 | 44.0 | 50.0 | 20.5 |
| 50 | 40.0 | 45.0 | 19.3 |

46.9°E at 38.0 % A, 43.0 % B, 19.0 % C.
*v. also* 1084, 1085, 1110.

1865. $C_6H_6O_2$, Catechol; B = $C_6H_6O_2$, Resorcinol; C = $C_{10}H_7NO_2$, α-Nitronaphthalene (420).
37.5°E at 20 Wt. % A, 15.0 % B, 65 % C.
*v. also* 1084, 1095, 1122.

1866. $C_6H_6O_2$, Catechol; B = $C_6H_6O_2$, Hydroquinol; C = $C_{10}H_7NO_2$, α-Nitronaphthalene (420).
48.0°E at 9.0 Wt. % A, 3.0 % B, 88.0 % C.
*v. also* 1085, 1095, 1148.

1867. $C_7H_4Cl_3NO_2$, *o*-Nitrophenylchloroform; B = $C_7H_4Cl_3NO_2$, *m*-Nitrophenylchloroform; C = $C_7H_4Cl_3NO_2$, *p*-Nitrophenylchloroform (173).

| Solvent = 12.7 % B + 87.3 % C | |
|---|---|
| °C | % A |
| 129.7E | 0 |
| 125.1 | 5 |
| 120.5 | 10 |
| 116.0 | 15 |

*v. also* 1281.

1868. $C_7H_5ClO_2$, *o*-Chlorobenzoic acid; B = $C_7H_5ClO_2$, *m*-Chlorobenzoic acid; C = $C_7H_5ClO_2$, *p*-Chlorobenzoic acid (50, 188.5).

Isothermal Compositions in % of Solid Phase

| Solvent | 82 % B + 18 % C | 86 % A + 14 % C | 57 % A + 43 % B |
|---|---|---|---|
| Solid phase | A | B | C |
| 240.0 °C | | | 93.4 |
| 230.0 | | | 81.2 |
| 220.0 | | | 70.7 |
| 210.0 | | | 61.0 |
| 200.0 | | | 52.3 |
| 190.0 | | | 44.5 |
| 180.0 | | | 37.7 |
| 170.0 | | | 31.6 |
| 160.0 | | | 26.0 |
| 150.0 | | 92.0 | 21.4 |
| 140.0 | 99.0 | 77.2 | 17.9 |
| 130.0 | 83.0 | 64.4 | 15.0 |
| 120.0 | 69.3 | 53.2 | 12.3 |
| 110.0 | 57.1 | 43.1 | 9.8 |

105.0°E at 52.0 % A, 39.0 % B, 9.0 % C.
*v. also* Eq. 1287, 1288, 1291.

1869. $C_7H_5ClO_2$, *o*-Chlorobenzoic acid; B = $C_7H_5ClO_2$, *m*-Chlorobenzoic acid; C = $C_7H_6O_2$, Benzoic acid (50, 188.5).

Isothermal Compositions in Mol % of Solid Phase

| Solvent | 27 % B + 73 % C | 32 % A + 68 % C | 56 % A + 44 % B |
|---|---|---|---|
| Solid phase | A | B | C |
| 150.0 °C | | 92.0 | |
| 140.0 | 98.9 | 76.7 | |
| 130.0 | 81.5 | 63.5 | |
| 120.0 | 67.4 | 52.2 | 97.5 |
| 110.0 | 54.3 | 42.0 | 84.7 |
| 100.0 | 43.4 | 34.3 | 73.5 |
| 90.0 | 34.6 | 26.5 | 63.0 |

81.7°E at 25.0 % A, 20.0 % B, 55.0 % C.
*v. also* Eq. 1287, 1289, 1292.

1870. $C_7H_5Cl_2NO_2$, *o*-Nitrobenzylidene chloride; B = $C_7H_5Cl_2NO_2$, *m*-Nitrobenzylidene chloride; C = $C_7H_5Cl_2NO_2$, *p*-Nitrobenzylidene chloride (173, 466).

Isothermal Compositions in % of Solid Phase

| Solvent | A + B, A + C, or A + (B + C) | B + C, B + A, or B + (C + A) | C + A, C + B, or C + (A + B) |
|---|---|---|---|
| Solid phase | A | B | C |
| 60.0 °C | | 90.3 | |
| 50.0 | | 71.1 | |
| 40.0 | | 55.5 | 95.0 |
| 30.0 | | 42.5 | 77.2 |
| 20.0 | 87.4 | 31.5 | 61.9 |
| 10.0 | 67.1 | 23.0 | 48.8 |
| 0.0 | 51.5 | 16.4 | 38.2 |

−2.0°E at 49.0 % A, 15.0 % B, 36.0 % C.

1871. $C_7H_5NO_4$, *o*-Nitrobenzoic acid; B = $C_7H_5NO_4$, *m*-Nitrobenzoic acid; C = $C_7H_5NO_4$, *p*-Nitrobenzoic acid (173, 466).

Isothermal Compositions in % of Solid Phase

| Solvent | A + B, A + C, or A + (B + C) | B + C, B + A, or B + (C + A) | C + A, C + B, or C + (A + B) |
|---|---|---|---|
| Solid phase | A | B | C |
| 230.0 °C | | | 86.6 |
| 220.0 | | | 74.5 |
| 210.0 | | | 63.2 |
| 200.0 | | | 53.7 |

1871.—(*Continued*)

| Solvent | A + B, A + C, or A + (B + C) | B + C, B + A, or B + (C + A) | C + A, C + B, or C + (A + B) |
|---|---|---|---|
| Solid phase | A | B | C |
| 190.0 | | | 45.0 |
| 180.0 | | | 37.8 |
| 170.0 | | | 31.3 |
| 160.0 | | | 25.5 |
| 150.0 | | | 20.8 |
| 140.0 | 88.1 | 99.0 | 16.5 |
| 130.0 | 73.5 | 87.7 | 12.5 |
| 120.0 | 60.5 | 77.0 | 9.0 |
| 110.0 | 49.3 | 67.0 | 6.0 |

*ca.* 100.0°E, at 39.0% A, 58.0% B, 3.0% C.

1872. $C_7H_5N_3O_6$, 2, 4, 6-Trinitrotoluene; B = $C_7H_6N_2O_4$, 2, 4-Dinitrotoluene; C = $C_7H_7NO_2$, *p*-Nitrotoluene (**31, 43, 129, 131**).

Isothermal Compositions in Mol % of Solid Phase

| Solvent | 40% B + 60% C | 30% A + 70% C | 38.5% A + 61.5% B |
|---|---|---|---|
| Solid phase | A | B | C |
| 70.0 °C | 80.0 | 99.8 | |
| 60.0 | 63.2 | 82.1 | |
| 50.0 | 49.3 | 66.9 | 97.3 |
| 40.0 | 38.0 | 53.5 | 80.0 |
| 30.0 | 28.6 | 42.2 | 64.8 |
| 20.0 | 22.2 | 34.4 | 52.0 |

16.7°E at 20.2% A, 31.8% B, 48.0% C.

*v. also* Eq. 1309, 1313, 1350.

1873. $C_7H_5N_3O_6$, 2, 4, 6-Trinitrotoluene; B = $C_7H_7NO_2$, *o*-Nitrotoluene; C = $C_7H_7NO_2$, *p*-Nitrotoluene (**30, 31, 33.5, 127, 130, 185**).

Isothermal Compositions

| Solvent | 77% B + 23% C | 50% B + 50% C | 31% A + 69% C |
|---|---|---|---|
| Solid phase | A, Mol % A | A, Mol % A | (31% A + 69% C), Mol % B |
| 70.0 °C | 80.2 | 80.0 | |
| 60.0 | 63.6 | 63.5 | |
| 50.0 | 50.2 | 50.0 | |
| 40.0 | 39.5 | 39.2 | |
| 30.0 | 31.1 | 30.3 | 6.0 |
| 20.0 | 25.0 | 24.5 | 23.0 |
| +10.0 | 19.8 | 19.3 | 37.7 |
| 0.0 | 15.7 | | 50.0 |
| −10.0 | 12.0 | | 87.6* |

−19.5°E at 9.5% A, 69.5% B, 21.0% C.

*v. also* Eq. 1312, 1313, 1440.

* Solid phase = B.

1874. $C_7H_6ClNO_2$, *o*-Nitrobenzyl chloride; B = $C_7H_6ClNO_2$, *m*-Nitrobenzyl chloride; C = $C_7H_6ClNO_2$, *p*-Nitrobenzyl chloride (**173**).

| Solvent = 64.6% A + 35.4% C | |
|---|---|
| °C | Mol % B |
| 31.8E | 0.0 |
| 30.6 | 5.0 |
| 29.8 | 10.0 |
| 27.8 | 15.0 |

*v. also* 1344.

1875. $C_7H_6N_2O_4$, 2, 4-Dinitrotoluene; B = $C_7H_7NO_2$, *o*-Nitrotoluene; C = $C_7H_7NO_2$, *p*-Nitrotoluene (**29.5, 30, 31, 127, 129, 185**).

1875.—(*Continued*)

Isothermal Compositions

| Solvent | 50% B + 50% C | 40% A + 60% C |
|---|---|---|
| Solid phase | A, Mol % A | (40% A + 60% C), Mol % B |
| 60.0 °C | 82.3 | |
| 50.0 | 67.5 | |
| 40.0 | 54.5 | |
| 30.0 | 43.5 | |
| 20.0 | 34.0 | 14.5 |
| +10.0 | 27.0 | 32.0 |
| 0.0 | | 47.3 |
| −10.0 | | 59.0 |

−20.0°E at 12.7% A, 68.7% B, 18.6% C.

*v. also* Eq. 1349, 1440, 1450.

1876. $C_7H_7NO_2$, *o*-Nitrotoluene; B = $C_7H_7NO_2$, *m*-Nitrotoluene; C = $C_7H_7NO_2$, *p*-Nitrotoluene, (**30, 32, 127, 185, 466**).

Isothermal Compositions in % of Solid Phase

| Solvent | 76% B + 24% C | 75% A + 25% C | 49% A + 51% B |
|---|---|---|---|
| Solid phase | A | B | C |
| 40.0 °C | | | 81.0 |
| 30.0 | | | 66.6 |
| 20.0 | | | 54.0 |
| +10.0 | | 88.7 | 43.5 |
| 0.0 | | 71.6 | 35.0 |
| −10.0 | 87.8 | 58.0 | 27.3 |
| −20.0 | 69.3 | 51.3 | 22.0 |
| −30.0 | 54.2 | 47.0 | 17.5 |

−40.0°E at 42.0% A, 44.0% B, 14.0% C.

1877. $C_{12}H_{16}O_4S_2$, Sulfonal; B = $C_{10}H_8O$, β-Naphthol; C = $C_{13}H_{10}O_3$, Salol (**38**).

Isothermal Compositions in Mol % of Solid Phase

| Solvent | 15% B +85% C | 30% B +70% C | 50% B +50% C | 70% B +30% C | 10% A +90% C | 50% A +50% C |
|---|---|---|---|---|---|---|
| Solid phase | A | A | A | A | B | B |
| 120 °C | 86.0 | 86.8 | 87.8 | 88.9 | 97.3 | 97.5 |
| 110 | 62.3 | 64.6 | 67.7 | 70.7 | 82.5 | 85.0 |
| 100 | 45.5 | 49.2 | 54.3 | 58.9 | 68.3 | 73.0 |
| 90 | 34.0 | 37.2 | 42.7 | 48.5 | 56.0 | 62.2 |
| 80 | 26.3 | 28.7 | 34.0 | 40.4 | 46.4 | 54.5 |
| 70 | 21.5 | 23.5 | 28.0 | 33.8 | 38.3 | 47.4 |
| 60 | 18.4 | 20.4 | 24.3 | | 31.0 | 40.8 |
| 50 | 14.6 | 16.6 | | | 25.3 | |
| 40 | 11.5 | | | | 20 | |
| 30 | 8.5 | | | | 17.5 | |

27.0°E at 6.0% A, 14.0% B, 80% C.

*v. also* 1488, 1489, 1599.

1878. $C_{10}H_5N_3O_6$, 1, 2, 5-Trinitronaphthalene; B = $C_{10}H_5N_3O_6$, 1, 3, 5-Trinitronaphthalene; C = $C_{10}H_5N_3O_6$, 1, 3, 8-Trinitronaphthalene (**369**).

*v. also* 1536, 1537, 1539.

1879. $C_{10}H_5N_3O_6$, 1, 3, 5-Trinitronaphthalene; B = $C_{10}H_6N_2O_4$, 1, 5-Dinitronaphthalene; C = $C_{10}H_6N_2O_4$, 1, 8-Dinitronaphthalene (**369**).

Isothermal Compositions

| Solvent | 50% B + 50% C, Wt. % A | 20% B + 80% C, Wt. % A | 60% A + 40% C, Wt. % B |
|---|---|---|---|
| 210 °C | | | 94.5 |
| 200 | | | 77.5 |
| 190 | | | 63.0 |
| 180 | 1.5 | | 53.0 |

1879.—(*Continued*)

| Solvent | 50% B + 50% C, Wt. % A | 20% B + 80% C, Wt. % A | 60% A + 40% C, Wt. % B |
|---|---|---|---|
| 170 | 11.0 | | 45.5 |
| 160 | 24.0 | | 38.0 |
| 150 | 38.0 | | 31.0 |
| 140 | 51.5 | 14.0 | 25.0 |
| 130 | 60.0 | 31.0 | 19.0 |
| 120 | 67.5 | 48.0 | 13.5 |
| 110 | 75.0 | 62.0 | 1.0 |
| 100 | 80.0 | 71.0 | |
| 90 | | 80.5 | |

*v. also* 1541, 1542, 1546.

1880. $C_{10}H_5N_3O_6$, 1, 3, 8-Trinitronaphthalene; B = $C_{10}H_6N_2O_4$, 1, 5-Dinitronaphthalene; C = $C_{10}H_6N_2O_4$, 1, 8-Dinitronaphthalene (**369**).

Isothermal Compositions

| Solvent | 50% B + 50% C | 25% A + 75% C | 50% A + 50% C | 75% A + 25% C | 50% A + 50% B |
|---|---|---|---|---|---|
| Continuous series of mixed crystals | | | | | |
| Solid phase | Wt. % A | Wt. % B | Wt. % B | Wt. % B | Wt. % C |
| 210 °C | 99.0 | 95.0 | 94.0 | 92.5 | |
| 200 | 96.5 | 79.5 | 78.0 | 75.0 | |
| 190 | 93.0 | 63.5 | 63.0 | 60.0 | |
| 180 | 89.0 | 53.0 | 52.0 | 50.0 | |
| 170 | 82.0 | 46.0 | 45.0 | 42.0 | 99.0 |
| 160 | 75.0 | 39.0 | 39.0 | 35.0 | 90.5 |
| 150 | 64.0 | 32.0 | 31.0 | 24.0 | 82.5 |
| 140 | | 23.0 | 23.0 | | |

*v. also* 1544, 1545, 1546.

1881. $C_{10}H_6N_2O_4$, 1, 5-Dinitronaphthalene; B = $C_{10}H_6N_2O_4$, 1, 8-Dinitronaphthalene; C = $C_{10}H_7NO_2$, $\alpha$-Nitronaphthalene (**369**).

Isothermal Compositions

| Solvent | 50% B + 50% C, Wt. % A | 50% A + 50% B, Wt. % C | 20% A + 80% B, Wt. % C |
|---|---|---|---|
| 210 °C | 95 | | |
| 200 | 81 | | |
| 190 | 66 | | |
| 180 | 54 | 1.0 | |
| 170 | 45.5 | 12.0 | |
| 160 | 38.2 | 25.5 | |
| 150 | 31.0 | 36.5 | |
| 140 | 25.5 | 45.0 | 6.0 |
| 130 | 22.0 | 51.0 | 17.0 |
| 120 | 19.0 | 56.0 | 29.5 |
| 110 | 13.0 | 63.0 | 42.0 |
| 100 | 4.0 | 69.0 | 53.0 |
| 90 | | 75.0 | 62.0 |
| 80 | | 79.0 | 69.0 |
| 70 | | 82.5 | 73.5 |
| 60 | | 85.5 | 78.5 |
| 50 | | 87.5 | 83.0 |

*v. also* 1546, 1547, 1548.

1882. $C_{12}H_9N$, Carbazole; B = $C_{14}H_{10}$, Anthracene; C = $C_{14}H_{10}$, Phenanthrene (**122, 345, 370, 475**).

Isothermal Compositions in Wt. % A

| Solvent | 80% B + 20% C | 60% B + 40% C | 40% B + 60% C | 20% B + 80% C | 5% B + 95% C |
|---|---|---|---|---|---|
| 240 °C | 90.2 | 90.5 | 91.0 | 91.5 | 91.9 |
| 230 | 72.1 | 73.5 | 75.5 | 77.9 | 79.5 |
| 220 | 53.5 | 58.0 | 62.2 | 65.8 | 68.2 |

1882.—(*Continued*)

| Solvent | 80% B +20% C | 60% B +40% C | 40% B +60% C | 20% B +80% C | 5% B +95% C |
|---|---|---|---|---|---|
| 210 | 25.0 | 42.5 | 49.3 | 54.5 | 57.7 |
| 200 | | 23.0 | 37.7 | 44.0 | 48.0 |
| 190 | | 7.5 | 25.8 | 35.5 | 39.9 |
| 180 | | | 14.7 | 28.5 | 33.3 |
| 170 | | | 6.0 | 23.2 | 27.5 |
| 160 | | | | 17.0 | 23.0 |
| 150 | | | | 11.0 | 19.5 |
| 140 | | | | 4.8 | 16.0 |
| 130 | | | | | 11.5 |
| 120 | | | | | 7.4 |
| 110 | | | | | 3.0 |
| Transition, % | 49.0 | 43.0 | 37.5 | 28.0 | 15.8 |

*v. also* 1676, 1677, 1748.

1883. $C_{12}H_9N$, Carbazole; B = $C_{14}H_{10}$, Anthracene; C = $C_{18}H_{12}$, Chrysene (**370**).

*v. also* 1676, Eq. 1678, 1750.

1883.1. $C_{14}H_{10}$, Anthracene (**484**).

Solubility in mixed liquids:

Acetone + ethyl alcohol; acetone + chloroform; acetone + carbon disulfide; benzene + ethyl alcohol; benzene + chloroform; benzene + carbon disulfide; carbon disulfide + ethyl alcohol; carbon tetrachloride + ethyl alcohol; toluene + carbon disulfide; toluene + chloroform.

1884. $C_{13}H_8N_2O_7$, Di-(*o*-nitrophenyl) carbonate; B = $C_{13}H_8N_2O_7$, Di-(*o*-, *p'*-nitrophenyl) carbonate; C = $C_{13}H_8N_2O_7$, Di-(*p*-nitrophenyl) carbonate (**159**).

Isothermal Compositions in % of Solid Phase

| Solvent | 47% B + 53% C | 65% A + 35% C | 67.5% A + 32.5% B |
|---|---|---|---|
| Solid phase | A | B | C |
| 140.0 °C | | | 96.1 |
| 130.0 | | 99.8 | 79.0 |
| 120.0 | | 75.0 | 63.2 |
| 110.0 | 94.0 | 56.4 | 49.8 |
| 100.0 | 73.6 | 42.2 | 39.5 |
| 90.0 | 57.5 | 30.0 | 31.0 |

84.5°E at 49.5% A, 23.8% B, 26.7% C.

*v. also* 1722, 1723, 1724.

1885. $C_{16}H_{32}O_2$, Palmitic acid; B = $C_{18}H_{34}O_2$, Oleic acid; C = $C_{18}H_{36}O_2$, Stearic acid (**69, 95.5, 117, 152, 329, 469**).

Isothermal Compositions in Wt. % B

| Solvent | 82% A + 18% C | 60% A + 40% C | 40% A + 60% C | 15% A + 85% C |
|---|---|---|---|---|
| 15.0 °C | 96.0 | 96.0 | 96.2 | 97.3 |
| 20.0 | 91.8 | 91.8 | 92.2 | 94.5 |
| 25.0 | 87.7 | 87.7 | 88.5 | 91.7 |
| 30.0 | 82.7 | 82.7 | 83.8 | 88.5 |
| 35.0 | 75.5 | 75.5 | 77.0 | 83.7 |
| 40.0 | 66.8 | 66.9 | 69.0 | 77.8 |
| 45.0 | 55.0 | 54.5 | 57.8 | 70.0 |
| 47.5 | 46.5 | 45.5 | 49.4 | 64.8 |
| 50.0 | 37.8 | 36.1 | 40.8 | 59.0 |
| 52.0 | 29.5 | 26.5 | 33.0 | 54.5 |
| 54.0 | 19.8 | 13.4 | 23.7 | 48.5 |
| 56.0 | 9.2 | | 14.8 | 41.5 |
| 58.0 | | | 5.2 | 32.5 |
| 60.0 | | | | 25.5 |
| 62.0 | | | | 17.0 |
| 64.0 | | | | 8.5 |

*v. also* 1795. 1796. 1826.

1886. $C_{16}H_{32}O_2$, Palmitic acid; B = $C_{18}H_{36}O_2$, Stearic acid; C = $C_{51}H_{98}O_6$, Tripalmitin (246.5).
*v. also* 1796, Eq. 1800, 1831.

1887. $C_{16}H_{32}O_2$, Palmitic acid; B = $C_{18}H_{36}O_2$, Stearic acid; C = $C_{57}H_{110}O_6$, Tristearin (246.7).
*v. also* 1796, 1801, 1832.

1888. $C_{16}H_{32}O_2$, Palmitic acid; B = $C_{51}H_{98}O_6$, Tripalmitin; C = $C_{57}H_{110}O_6$, Tristearin (246.7).
*v. also* 1801, 1850, Eq. 1800.

1889. $C_{18}H_{36}O_2$, Stearic acid; B = $C_{51}H_{98}O_6$, Tripalmitin; C = $C_{57}H_{110}O_6$, Tristearin (246.7).
*v. also* 1832, 1850, Eq. 1831.

1890. $C_{51}H_{98}O_6$, Tripalmitin; B = $C_{57}H_{104}O_6$, Triolein; C = $C_{57}H_{110}O_6$, Tristearin (261.5)

ISOTHERMAL COMPOSITIONS

| Solvent | 90% B + 10% C | 40% B + 60% C | 40% B + 60% C | 30% A + 70% C | 70% A + 30% C |
|---|---|---|---|---|---|
| Continuous series of mixed crystals | | | | | |
| Solid phase | Wt. % A | Wt. % A | Wt. % A | Wt. % B | Wt. % B |
| 10.0 °C | | | | 98.0 | 97.0 |
| 20.0 | | | | 96.0 | 94.0 |
| 30.0 | | | | 93.0 | 89.5 |
| 40.0 | 1.5 | | | 87.0 | 78.0 |
| 45.0 | 29.0 | | | 81.5 | 56.0 |
| 50.0 | 39.5 | | | 74.5 | 40.0 |
| 52.0 | 44.0 | | | 70.5 | 25.0 |
| 54.0 | 49.0 | 36.0 | 63.0 | 65 | 11.0 |

| Solvent | 90% B + 10% C | 40% B + 60% C | 40% B + 60% C | 30% A + 70% C | 70% A + 30% C |
|---|---|---|---|---|---|
| Continuous series of mixed crystals | | | | | |
| Solid phase | Wt. % A | Wt. % A | Wt. % A | Wt. % A | Wt. % B |
| 56.0 | 55.0 | 27.3 | 72.0 | 58 | |
| 58.0 | 63.0 | 20.5 | 80.0 | 43.2 | |
| 60.0 | 74.5 | 17.0 | 87.5 | | |
| 62.0 | 94.0 | 13.0 | 97.0 | | |
| 64.0 | | 9.0 | | | |
| 65.0 | | 6.0 | | | |

*v. also* 1849, 1850, 1851.

## EQUATIONS

$\text{Log}_{10}\frac{1}{x} = \frac{0.05223}{T}\,a + b$, in which $x$ is the mole fraction of the given constituent (the "solute") in the solution saturated with respect to it at $T$°K; a is the latent heat of fusion of this constituent in joules per gram-mole if the solution is "ideal;" b is a constant; and c = 100 × Mol. wt. solute/Mol. wt. solvent. The solubility, $S$, in grams of solute per 100 grams of solvent, is given by $S = \frac{c}{\left(\frac{1}{x} - 1\right)}$.

| No. | Formula | Name | M. P. | a | b | c | Range, °C | Eut. temp. and % | Lit. |
|---|---|---|---|---|---|---|---|---|---|
| 7 | A $CCl_4$ | Carbon tetrachloride | | | | | | | (344) |
| | B $C_6H_4Br_2$ | *p*-Dibromobenzene | 89.0 | 23,320 | − 3.363 | 153.4 | 20.0 − 89.0 | | |
| 9 | A $CCl_4$ | Carbon tetrachloride | | | | | | | (344) |
| | B $C_7H_6O_2$ | Benzoic acid | | 29,870 | − 3.955 | 79.36 | 10.0 − 40.0 | | |
| 11 | A $CCl_4$ | Carbon tetrachloride | | | | | | | (419, 475) |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 21,370 | − 3.159 | 83.28 | 0.0 − 80.1 | | |
| 12 | A $CCl_4$ | Carbon tetrachloride | | | | | | | (475) |
| | B $C_{12}H_9N$ | Carbazole | 245.2 | 30,630 | − 2.406 | 108.6 | 20.0 − 60.0 | | |
| 13 | A $CCl_4$ | Carbon tetrachloride | | | | | | | (345) |
| | B $C_{12}H_{10}$ | Acenaphthene | 95.0 | 27,800 | − 3.945 | 100.2 | 10.0 − 95.0 | | |
| 14 | A $CCl_4$ | Carbon tetrachloride | | | | | | | (345) |
| | B $C_{13}H_{10}$ | Fluorene | 114.5 | 25,590 | − 3.448 | 108.0 | 10.0 − 60.0 | | |
| 15 | A $CCl_4$ | Carbon tetrachloride | | | | | | | (158, 475) |
| | B $C_{14}H_{10}$ | Anthracene | 216.5 | 22,010 | − 1.650 | 115.8 | 20.0 − 63.0 | | |
| 16 | A $CCl_4$ | Carbon tetrachloride | | | | | | | (153, 158, 475) |
| | B $C_{14}H_{10}$ | Phenanthrene | 99.0 | 23,530 | − 3.309 | 115.8 | − 10.0 − 75.0 | | |
| 22 | A $CS_2$ | Carbon disulfide | | | | | | | (419) |
| | B $C_6H_4Br_2$ | *p*-Dibromobenzene | 87.0 | 21,070 | − 3.055 | 309.9 | 0.0 − 87.0 | | |
| 28 | A $CS_2$ | Carbon disulfide | | | | | | | (475) |
| | B $C_{12}H_9N$ | Carbazole | 245.2 | 27,570 | − 1.972 | 219.4 | 20.0 − 40.0 | | |
| 29 | A $CS_2$ | Carbon disulfide | | | | | | | (345) |
| | B $C_{12}H_{10}$ | Acenaphthene | 95.0 | 23,710 | − 3.362 | 202.6 | 10.0 − 95.0 | | |
| 30 | A $CS_2$ | Carbon disulfide | | | | | | | (475) |
| | B $C_{14}H_{10}$ | Anthracene | 216.5 | 26,150 | − 2.468 | 234.0 | 10.0 − 40.0 | | |
| 31 | A $CS_2$ | Carbon disulfide | | | | | | | (153) |
| | B $C_{14}H_{10}$ | Phenanthrene | 99.0 | 25,530 | − 3.767 | 234.0 | − 5.0 − 40.0 | | |
| 33 | A $CHBr_3$ | Bromoform | 7.5 | 11,780 | − 2.192 | 324.8 | − 26.0 − 7.5 | −26.0° | (415) |
| | B $C_6H_6$ | Benzene | 5.5 | 10,820 | − 2.028 | 30.88 | − 15.0 − 5.5 | 50.0 M % B | |
| 34 | A $CHBr_3$ | Bromoform | 7.5 | 11,780 | − 2.192 | 274.4 | − 35.0 − 7.5 | | (22) |
| | B $C_7H_8$ | Toluene | | | | | | | |
| 39 | A $CHCl_3$ | Chloroform | | | | | | | (436) |
| | B $C_3H_7NO_2$ | Urethane | 47.0 | 18,660 | − 3.045 | 74.61 | 15.0 − 47.0 | | |
| 45 | A $CHCl_3$ | Chloroform | −63.0 | 12,165 | − 3.023 | 128.3 | − 71.0 −− 63.0 | −71.0° | (458) |
| | B $C_6H_7N$ | Aniline | − 6.0 | 10,485 | − 2.050 | 77.95 | − 50.0 −− 6.0 | 24.0 M % B | |
| 51 | A $CHCl_3$ | Chloroform | | | | | | | (112, 436, 475) |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 17,570 | − 2.598 | 107.5 | 10.0 − 80.1 | | |
| 52 | A $CHCl_3$ | Chloroform | | | | | | | (345, 436) |
| | B $C_{12}H_{10}$ | Acenaphthene | 95.0 | 20,290 | − 2.880 | 129.2 | 50.0 − 95.0 | | |
| 53 | A $CHCl_3$ | Chloroform | | | | | | | (460) |
| | B $C_{14}H_8O_2$ | Anthraquinone | 285.2 | 19,140 | − 0.960 | 170.0 | 0.0 − 60.0 | | |
| 54 | A $CHCl_3$ | Chloroform | | | | | | | (153) |
| | B $C_{14}H_{10}$ | Phenanthrene | 99.0 | 16,230 | − 2.280 | 149.1 | − 10.0 − 30.0 | | |
| 85 | A $CH_4O$ | Methyl alcohol | | | | | | | (436) |
| | B $C_3H_7NO_2$ | Urethane | 47.0 | 17,790 | − 2.935 | 278.1 | 0.0 − 47.0 | | |

**Equations.**—(*Continued*)

| No. | Formula | Name | M. P. | a | b | c | Range, °C | Eut. temp. and % | Lit. |
|---|---|---|---|---|---|---|---|---|---|
| 95 | A $CH_4O$ | Methyl alcohol | | | | | | | (136) |
| | B $C_8H_9NO$ | Acetanilide | | 23,740 | − 3.208 | 421.7 | 0.0 − 60.0 | | |
| 105 | A $CH_4O$ | Methyl alcohol | | | | | | | (475) |
| | B $C_{14}H_8O_2$ | Anthraquinone | 285.2 | 35,970 | − 1.939 | 649.7 | 20.0 − 50.0 | | |
| 106 | A $CH_4O$ | Methyl alcohol | | | | | | | (475) |
| | B $C_{14}H_{10}$ | Anthracene | 216.5 | 34,150 | − 2.303 | 556.1 | 10.0 − 60.0 | | |
| 185 | A $C_2H_2Cl_4$ | Tetrachloroethane | | | | | | | (475) |
| | B $C_{14}H_8O_2$ | Anthraquinone | 285.2 | 22,525 | − 1.754 | 124.0 | 20.0 − 140.0 | | |
| 186 | A $C_2H_2Cl_4$ | Tetrachloroethane | | | | | | | (475) |
| | B $C_{14}H_{10}$ | Anthracene | 216.5 | 24,310 | − 2.423 | 106.1 | 10.0 − 140.0 | | |
| 187 | A $C_2H_2Cl_4$ | Tetrachloroethane | | | | | | | (475) |
| | B $C_{14}H_{10}$ | Phenanthrene | 99.0 | 15,320 | − 2.152 | 106.3 | 0.0 − 85.0 | | |
| 189 | A $C_2H_3ClO_2$ | α-Chloroacetic acid | 61.7 | 14,645 | − 2.284 | 157.3 | − 4.0 − 61.7 | −4.0° | (209, 315) |
| | B $C_2H_4O_2$ | Acetic acid | 16.7 | 10,430 | − 1.880 | 63.55 | − 4.0 − 16.7 | 72.0 M % B | |
| 190 | A $C_2H_3ClO_2$ | α-Chloroacetic acid | 61.7 | 16,660 | − 2.598 | 109.8 | 26.0 − 61.7 | 26.0° | (209) |
| | B $C_4H_6O_2$ | Crotonic acid | 71.9 | 12,120 | − 1.835 | 91.1 | 26.0 − 71.9 | 52 M % B | |
| 193 | A $C_2H_3ClO_2$ | α-Chloroacetic acid | 61.7 | 20,870 | − 3.257 | 100.4 | 16.5 − 61.7 | 16.5° | (210, 313) |
| | B $C_6H_6O$ | Phenol | 42.4 | 10,320 | − 1.708 | 99.6 | 25.0 − 42.4 | 69.0 M % B | |
| 195 | A $C_2H_3ClO_2$ | α-Chloroacetic acid | 61.7 | 20,270 | − 3.142 | 77.4 | 46.7 − 61.7 | 46.7° | (209) |
| | B $C_7H_6O_2$ | Benzoic acid | 121.5 | 17,790 | − 2.357 | 129.2 | 60.0 − 121.5 | 28.5 M % B | |
| 196 | A $C_2H_3ClO_2$ | α-Chloroacetic acid | 61.7 | 24,030 | − 3.748 | 87.4 | 15.8 − 61.7 | 15.8° | (210, 313) |
| | B $C_7H_8O$ | o-Cresol | 31.0 | 18,060 | − 3.101 | 114.4 | 15.8 − 31.0 | 69.1 M % B | |
| 197 | A $C_2H_3ClO_2$ | α-Chloroacetic acid | 61.7 | 24,030 | − 3.748 | 87.4 | 5.0 − 61.7 | 81.3° | (313) |
| | B $C_7H_8O$ | m-Cresol | 10.5 | 10,190 | − 1.876 | 114.4 | − 3.0 − 10.5 | 81.3 M % B | |
| 198 | A $C_2H_3ClO_2$ | α-Chloroacetic acid | 61.7 | 24,030 | − 3.748 | 87.4 | 20.0 − 61.7 | 13.4° | (313) |
| | B $C_7H_8O$ | p-Cresol | 36.0 | 10,625 | − 1.795 | 114.4 | 13.4 − 36.0 | 72.0 M % B | |
| 203 | A $C_2H_3ClO_2$ | α-Chloroacetic acid | 61.7 | 16,175 | − 2.523 | 69.43 | 30.5 − 61.7 | 30.5° | (209) |
| | B $C_8H_8O_2$ | Phenylacetic acid | 77.5 | 14,710 | − 2.192 | 144.04 | 30.5 − 77.5 | 46.0 M % B | |
| 204 | A $C_2H_3ClO_2$ | α-Chloroacetic acid | 61.7 | 21,160 | − 3.211 | 69.43 | 47.3 − 61.7 | 47.3° | (209) |
| | B $C_8H_8O_2$ | o-Toluic acid | 103.4 | 21,920 | − 3.042 | 144.04 | 75.0 − 103.4 | 28.2 M % B | |
| 205 | A $C_2H_3ClO_2$ | α-Chloroacetic acid | 61.7 | 19,725 | − 3.077 | 69.43 | 46.5 − 61.7 | 46.5° | (209) |
| | B $C_8H_8O_2$ | m-Toluic acid | 107.6 | 18,860 | − 2.587 | 144.04 | 80.0 − 107.6 | 28.8 M % B | |
| 206 | A $C_2H_3ClO_2$ | α-Chloroacetic acid | 61.7 | 19,725 | − 3.077 | 69.43 | 56.8 − 61.7 | 56.8° | (209) |
| | B $C_8H_8O_2$ | p-Toluic acid | 178.6 | 24,620 | − 2.847 | 144.04 | 56.8 − 178.6 | 9.3 M % B | |
| 208 | A $C_2H_3ClO_2$ | α-Chloroacetic acid | 61.7 | 18,380 | − 2.866 | 63.8 | 47.6 − 61.7 | 47.6° | (209) |
| | B $C_9H_8O_2$ | Cinnamic acid | 136.8 | 18,210 | − 2.308 | 156.7 | 85.0 − 136.8 | 25.0 M % B* | |
| 215 | A $C_2H_3ClO_2$ | α-Chloroacetic acid | 61.4 | 22,810 | − 3.562 | 44.1 | 26.7 − 61.4 | 26.7° | (315) |
| | B $C_{13}H_{10}O_3$ | Salol | 40.85 | 25,460 | − 4.237 | 226.8 | 26.7 − 40.85 | 60.5 M % B | |
| 220 | A $C_2H_3ClO_2$ | β-Chloroacetic acid | 56.6 | 18,090 | − 2.865 | 100.4 | 20.0 − 56.6 | 11.8° | (313) |
| | B $C_6H_6O$ | Phenol | 42.0 | 10,320 | − 1.708 | 99.6 | 25.0 − 42.4 | 65.0 M % B | |
| 221 | A $C_2H_3ClO_2$ | β-Chloroacetic acid | 56.6 | 18,130 | − 2.873 | 87.4 | 13 − 56.6 | 13.0° | (313) |
| | B $C_7H_8O$ | o-Cresol | 31.0 | 18,060 | − 3.101 | 114.4 | 13 − 31.0 | 63.55 M % B | |
| 222 | A $C_2H_3ClO_2$ | β-Chloroacetic acid | 56.6 | 18,680 | − 2.960 | 87.4 | − 4.5 − 56.6 | −4.5° | (313) |
| | B $C_7H_8O$ | m-Cresol | 10.5 | 10,190 | − 1.876 | 114.4 | − 4.5 − 10.5 | 78.7 M % B | |
| 223 | A $C_2H_3ClO_2$ | β-Chloroacetic acid | 56.6 | 18,090 | − 2.866 | 87.4 | 20.0 − 56.6 | 10.7° | (313) |
| | B $C_7H_8O$ | p-Cresol | 36.0 | 10,625 | − 1.795 | 114.4 | 10.7 − 36.0 | 69.3 M % B | |
| 230 | A $C_2H_3ClO_2$ | β-Chloroacetic acid | 56.6 | 20,770 | − 3.292 | 44.1 | 25.4 − 56.4 | 25.4° | (315) |
| | B $C_{13}H_{10}O_3$ | Salol | 40.85 | 25,460 | − 4.237 | 226.8 | 25.4 − 40.85 | 57.0 M % B | |
| 245 | A $C_2H_4Br_2$ | Ethylene dibromide | 9.7 | 11,520 | − 2.128 | 240.6 | − 20.0 − 9.7 | −27.6° | (36) |
| | B $C_6H_6$ | Benzene | 5.5 | 10,450 | − 1.959 | 41.56 | − 27.6 − 5.5 | 54.0 M % B | |
| 248 | A $C_2H_4Br_2$ | Ethylene dibromide | 9.7 | 12,475 | − 2.304 | 142.2 | − 10 − 9.7 | −20.0° | (375) |
| | B $C_6H_{12}O_3$ | Paraldehyde | 12.0 | 13,470 | − 2.468 | 70.32 | − 20 − 12.0 | 49.0 M % B | |
| 249 | A $C_2H_4Br_2$ | Ethylene dibromide | 9.7 | 11,480 | − 2.121 | 109.8 | − 10 − 9.7 | −12.4° | (375) |
| | B $C_7H_7Br$ | p-Bromotoluene | 26.7 | 15,880 | − 2.767 | 91.05 | 0.0 − 26.74 | 36.1 M % B | |
| 250 | A $C_2H_4Br_2$ | Ethylene dibromide | 9.7 | 11,980 | − 2.212 | 204.0 | − 40.0 − 9.7 | | (22) |
| | B $C_7H_8$ | Toluene | | | | | | | |
| 251 | A $C_2H_4Br_2$ | Ethylene dibromide | 9.7 | 11,710 | − 2.163 | 177.05 | − 20.0 − 9.7 | −20° | (375) |
| | B $C_8H_{10}$ | p-Xylene | 13.5 | 14,660 | − 2.672 | 56.48 | − 20.0 − 13.5 | 44.0 M % B | |
| 252 | A $C_2H_4Br_2$ | Ethylene dibromide | 9.7 | 11,445 | − 2.113 | 146.65 | 0.25− 9.7 | 0.25° | (16, 86) |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 18,525 | − 2.739 | 68.19 | 30 − 80.1 | 15.1 M % B | |
| 255 | A $C_2H_4Br_2$ | Ethylene dibromide | 9.7 | 11,520 | − 2.128 | 111.05 | − 5.3 − 9.7 | −5.3° | (86) |
| | B $C_{12}H_{11}N$ | Diphenylamine | 52.9 | 18,140 | − 2.907 | 90.05 | 5.0 − 52.9 | 24.4 M % B | |
| 257 | A $C_2H_4Cl_2$ | Ethylene dichloride | −40.0 | 12,480 | − 2.878 | 126.7 | − 53.0 − −40.0 | −53.0° | (21) |
| | B $C_6H_6$ | Benzene | 5.5 | 9,940 | − 1.798 | 78.93 | − 53.0 − 5.5 | 32.5 M % B | |
| 258 | A $C_2H_4Cl_2$ | Ethylene dichloride | | | | | | | (345) |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 18,270 | − 2.702 | 129.4 | − 10 − 80.1 | | |
| 267 | A $C_2H_4O_2$ | Acetic acid | 16.7 | 11,575 | − 2.087 | 50.86 | 8.4 − 16.7 | 8.4° | (212) |
| | B $C_4H_6O_4$ | Dimethyl oxalate | 53.2 | 34,780 | − 3.533 | 196.6 | 20.0 − 53.2 | 14.0 M % B | |
| 275 | A $C_2H_4O_2$ | Acetic acid | 16.7 | 10,870 | − 1.959 | 63.83 | − 15.0 − 16.7 | −15.0° | (312, 345) |
| | B $C_6H_6O$ | Phenol | 40.5 | 12,480 | − 2.078 | 156.7 | 10.0 − 40.5 | 41.5 M % B | |
| 277 | A $C_2H_4O_2$ | Acetic acid | 16.7 | 11,385 | − 2.052 | 41.2 | − 7.0 − 16.7 | −7.0° | (212) |
| | B $C_6H_{10}O_4$ | Dimethyl succinate | 18.2 | 27,520 | − 4.938 | 242.7 | − 7.0 − 18.2 | 34.0 M % B | |
| 279 | A $C_2H_4O_2$ | Acetic acid | 16.7 | 11,385 | − 2.052 | 203.3 | 9.5 − 16.7 | 9.5° | (209, 345 |
| | B $C_7H_6O_2$ | Benzoic acid | 121.4 | 18,510 | − 2.450 | 49.19 | 40.0 − 121.4 | 12.0 M % B | |
| 284 | A $C_2H_4O_2$ | Acetic acid | 15.05 | 11,290 | − 2.047 | 39.99 | − 4.27− 15.05 | −4.27° | (375) |
| | B $C_{10}H_{14}O$ | Thymol | 49.32 | 19,890 | − 3.222 | 250.0 | 20.0 − 49.32 | 28.4 M % B | |

*36.3 M % B at 70.0°.

Equations.—(*Continued*)

| No. | Formula | Name | M. P. | a | b | c | Range, °C | Eut. temp. and % | Lit. |
|---|---|---|---|---|---|---|---|---|---|
| 285 | A $C_2H_4O_2$ | Acetic acid | | | | | | | (475) |
| | B $C_{12}H_9N$ | Carbazole | 245.2 | 25,530 | − 1.780 | 276.5 | 20.0 − 110 | | |
| 287 | A $C_2H_4O_2$ | Acetic acid | | | | | | | (475) |
| | B $C_{14}H_8O_2$ | Anthraquinone | 285.2 | 31,910 | − 2.093 | 344.5 | 25.0 − 100.0 | | |
| 288 | A $C_2H_4O_2$ | Acetic acid | | | | | | | (475) |
| | B $C_{14}H_{10}$ | Anthracene | 216.5 | 31,840 | − 2.470 | 296.7 | 20.0 − 100.0 | | |
| 292 | A $C_2H_5NO$ | Acetamide | 79.0 | 14,590 | − 2.168 | 128.2 | 40.0 − 78.5 | | (436) |
| | B $C_2H_6O$ | Ethyl alcohol | | | | | | | |
| 293 | A $C_2H_5NO$ | Acetamide | 79.0 | 15,980 | − 2.370 | 66.30 | 27.2 − 79.0 | 27.2° | (344) |
| | B $C_3H_7NO_2$ | Urethane | 49.0 | 18,660 | − 3.026 | 150.9 | 27.2 − 49.0 | 39.0 M % B | |
| 314 | A $C_2H_6O$ | Ethyl alcohol | | | | | | | (436) |
| | B $C_3H_7NO_2$ | Urethane | 47.0 | 20,290 | − 3.331 | 193.3 | 15.0 − 47.0 | | |
| 335 | A $C_2H_6O$ | Ethyl alcohol | | | | | | | (436) |
| | B $C_7H_9N$ | *p*-Toluidine | 42.0 | 27,000 | − 4.472 | 232.4 | 0.0 − 42.0 | | |
| 345 | A $C_2H_6O$ | Ethyl alcohol | | | | | | | (136) |
| | B $C_8H_9NO$ | Acetanilide | | 15,690 | − 2.120 | 293.3 | 0.0 − 80.0 | | |
| 356 | A $C_2H_6O$ | Ethyl alcohol | | | | | | | (475) |
| | B $C_{14}H_8O_2$ | Anthraquinone | 285.2 | 42,640 | − 3.179 | 451.7 | 20.0 − 70.0 | | |
| 380 | A $C_3H_6O$ | Acetone | | | | | | | (345) |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 23,760 | − 3.513 | 228.4 | 10.0 − 80.1 | | |
| 381 | A $C_3H_6O$ | Acetone | | | | | | | (475) |
| | B $C_{12}H_9N$ | Carbazole | 245.2 | 12,390 | − 0.595 | 287.7 | 20.0 − 60.0 | | |
| 382 | A $C_3H_6O$ | Acetone | | | | | | | (345) |
| | B $C_{12}H_{10}$ | Acenaphthene | 95.0 | 37,980 | − 5.390 | 265.5 | 10.0 − 95.0 | | |
| 383 | A $C_3H_6O$ | Acetone | | | | | | | (345) |
| | B $C_{13}H_{10}$ | Fluorene | 114.5 | 30,250 | − 4.078 | 286.1 | 10.0 − 50.0 | | |
| 384 | A $C_3H_6O$ | Acetone | | | | | | | (475) |
| | B $C_{14}H_8O_2$ | Anthraquinone | 285.2 | 27,570 | − 1.436 | 358.5 | 15.0 − 60.0 | | |
| 385 | A $C_3H_6O$ | Acetone | | | | | | | (475) |
| | B $C_{14}H_{10}$ | Anthracene | 216.5 | 26,640 | − 2.176 | 307.0 | 15.0 − 55.0 | | |
| 386 | A $C_3H_6O$ | Acetone | | | | | | | (153) |
| | B $C_{14}H_{10}$ | Phenanthrene | 99.0 | 22,080 | − 3.096 | 307.0 | − 10.0 − 30.0 | | |
| 389 | A $C_3H_7NO_2$ | Urethane | 47.0 | 21,151 | − 3.451 | 148.2 | 25.0 − 47.0 | * | (436) |
| | B $C_3H_8O$ | Propyl alcohol | | | | | | | |
| 390 | A $C_3H_7NO_2$ | Urethane | 47.0 | 22,010 | − 3.571 | 101.1 | 35.0 − 47.0 | 20° | (245) |
| | B $C_5H_{12}O$ | *n*-Amyl alcohol | | | | | | 26.0 M % A | |
| 397 | A $C_3H_7NO_2$ | Urethane | 48.3 | 18,080 | − 2.932 | 65.94 | 41.0 − 48.3 | 41.0° | (344, 345) |
| | B $C_8H_9NO$ | Acetanilide | 113.0 | 26,220 | − 3.545 | 151.6 | 41.0 − 113.0 | 15.3 M % B | |
| 468 | A $C_4H_8O_2$ | Ethyl acetate | | | | | | | (345) |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 22,200 | − 3.282 | 145.3 | 10.0 − 80.1 | | |
| 469 | A $C_4H_8O_2$ | Ethyl acetate | | | | | | | (475) |
| | B $C_{14}H_{10}$ | Anthracene | 216.5 | 26,720 | − 2.319 | 197.7 | 25.0 − 70.0 | | |
| 470 | A $C_4H_8O_2$ | Ethyl acetate | | | | | | | (475) |
| | B $C_{14}H_{10}$ | Phenanthrene | 99.0 | 24,910 | − 3.534 | 202.5 | 10.0 − 65.0 | | |
| 496 | A $C_4H_{10}O$ | Ethyl ether | | | | | | | (419) |
| | B $C_6H_4Br_2$ | *p*-Dibromobenzene | 87 | 24,210 | − 3.512 | 318.4 | 10.0 − 87.0 | | |
| 503 | A $C_4H_{10}O$ | Ethyl ether | | | | | | | (345) |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 22,500 | − 3.326 | 172.9 | 15.0 − 35.0 | | |
| 504 | A $C_4H_{10}O$ | Ethyl ether | | | | | | | (475) |
| | B $C_{14}H_8O_2$ | Anthraquinone | 285.2 | 27,070 | − 1.076 | 280.8 | 5.0 − 30.0 | | |
| 505 | A $C_4H_{10}O$ | Ethyl ether | | | | | | | (153, 157) |
| | B $C_{14}H_{10}$ | Phenanthrene | 99.0 | 21,610 | − 2.968 | 240.5 | − 10.0 − 30.0 | | |
| 509 | A $C_5H_5N$ | Pyridine | −39.4 | 7,407 | − 1.656 | 101.25 | − 57 − −39.4 | −57.0° | (151, 385) |
| | B $C_6H_6$ | Benzene | 5.5 | 11,325 | − 2.124 | 98.75 | − 40 − 5.5 | 26.5 M % B | |
| 516 | A $C_5H_5N$ | Pyridine | −39.4 | | | | | −41.0° | (151, 345) |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 18,370 | − 2.717 | 162.0 | 0.0 − 80.1 | 3.8 M % B | |
| 518 | A $C_5H_5N$ | Pyridine | | | | | | | (345) |
| | B $C_{12}H_{10}$ | Acenaphthene | 95.0 | 27,350 | − 3.881 | 195.0 | 20.0 − 95.0 | | |
| 519 | A $C_5H_5N$ | Pyridine | | | | | | | (345) |
| | B $C_{13}H_{10}$ | Fluorene | 114.5 | 22,980 | − 3.097 | 210.1 | 10.0 − 114.5 | | |
| 520 | A $C_5H_5N$ | Pyridine | | | | | | | (475) |
| | B $C_{14}H_8O_2$ | Anthraquinone | 285.2 | 30,090 | − 2.533 | 263.2 | 10.0 − 100.0 | | |
| 522 | A $C_5H_5N$ | Pyridine | | | | | | | (475) |
| | B $C_{14}H_{10}$ | Phenanthrene | 99.0 | 17,810 | − 2.502 | 225.5 | 5.0 − 75.0 | | |
| 524 | A $C_5H_{11}N$ | Piperidine | −13.0 | 13,590 | − 2.728 | 103.65 | − 30 − −13 | −30.0° | (321) |
| | B $C_6H_{12}$ | Cyclohexane | 6.2 | 19,815 | − 3.704 | 96.5 | − 5.0 − 6.2 | 35.5 M % B | |
| 555 | A $C_6H_3N_3O_6$ | 1, 3, 5-Trinitrobenzene | 120.3 | 15,050 | − 2.002 | 126.7 | 76 − 120.3 | 76.0° | (43) |
| | B $C_6H_4N_2O_4$ | *o*-Dinitrobenzene | 116.5 | 22,690 | − 3.041 | 78.9 | 69.0 − 116.5 | 44.5 M % B | |
| | A $C_6H_3N_3O_6$ | 1, 3, 5-Trinitrobenzene (metastable) | 106.3 | 13,430 | − 1.849 | 126.7 | 69.0 − 106.3 | 69.0° | |
| | | | | | | | | 37.4 M % B | |
| 556 | A $C_6H_3N_3O_6$ | 1, 3, 5-Trinitrobenzene | 120.3 | 15,080 | − 2.002 | 126.7 | 59.0 − 120.3 | 59.0° | (43) |
| | B $C_6H_4N_2O_4$ | *m*-Dinitrobenzene | 89.9 | 17,980 | − 2.588 | 78.9 | 52.5 − 89.9 | 57.5 M % B | |
| | A $C_6H_3N_3O_6$ | 1, 3, 5-Trinitrobenzene (metastable) | 106.3 | 13,430 | − 1.849 | 126.7 | 52.5 − 106.3 | 52.5° | |
| | | | | | | | | 50.7 M % B | |

* 19.5 M % A at 0°, 32.0 M % A at 10°.

Equations.—(*Continued*)

| No. | Formula | Name | M. P. | a | b | c | Range, °C | Eut. temp. and % | Lit. |
|---|---|---|---|---|---|---|---|---|---|
| 564 | A $C_6H_3N_3O_6$ | 1, 3, 5-Trinitrobenzene | 120.3 | 14,730 | − 1.951 | 93.9 | 55.8 − 120.3 | 55.8° | (43, 109) |
| | B $C_7H_5N_3O_6$ | Trinitrotoluene | 80.2 | 21,340 | − 3.157 | 106.5 | 52 − 80.2 | 57.0 M % B | |
| | A $C_6H_3N_3O_6$ | 1, 3, 5-Trinitrobenzene (metastable) | 106.3 | 14,200 | − 1.954 | 93.9 | 52.0 − 106.3 | 52.0° | |
| | | | | | | | | 53.0 M % B | |
| 565 | A $C_6H_3N_3O_6$ | 1, 3, 5-Trinitrobenzene | 120.3 | 14,830 | − 1.969 | 74.24 | 82.6 − 120.3 | 82.6° | (43) |
| | B $C_7H_5N_3O_8$ | Tetranitrophenylmethylaniline (Tetryl) | 128.5 | 24,790 | − 3.222 | 134.7 | 75.5 − 128.5 | 38.3 M % B | |
| | A $C_6H_3N_3O_6$ | 1, 3, 5-Trinitrobenzene (metastable) | 106.3 | 13,870 | − 1.910 | 74.24 | 75.5 − 106.3 | 75.5° | |
| | | | | | | | | 32.0 M % B | |
| 583 | A $C_6H_3N_3O_7$ | Picric acid | 122.3 | 17,605 | − 2.326 | 136.2 | 61.0 − 122.3 | 61.0° | (43) |
| | B $C_6H_4N_2O_4$ | *m*-Dinitrobenzene | 89.9 | 16,520 | − 2.372 | 76.85 | 61.0 − 89.9 | 62.4 M % B | |
| 584 | A $C_6H_3N_3O_7$ | Picric acid | 122.3 | 17,410 | − 2.300 | 124.4 | 87.0 − 122.3 | 81.5° | (43) |
| | B $C_6H_4N_2O_5$ | 2, 4-Dinitrophenol | 112.5 | 23,730 | − 3.217 | 80.37 | 92.0 − 112.5 | 47.5 M % B | |
| 585 | A $C_6H_3N_3O_7$ | Picric acid | 122.4 | 40,200 | − 5.310 | 100.4 | 113.5 − 122.4 | 113.5° | (105) |
| | B $C_6H_4N_4O_6$ | Picramide | 184.0 | 27,490 | − 3.142 | 99.57 | 127.0 − 184.0 | 25.0 M % B | |
| 586 | A $C_6H_3N_3O_7$ | Picric acid | 120.0 | 17,410 | − 2.314 | 164.8 | 34.0 − 120.0 | 34.0° | (259) |
| | B $C_6H_5NO_3$ | *o*-Nitrophenol | 45.5 | 17,890 | − 2.934 | 60.70 | 34.0 − 45.5 | 77.8 M % B | |
| 587 | A $C_6H_3N_3O_7$ | Picric acid | 120.0 | 19,146 | − 2.542 | 164.8 | 71.0 − 120.0 | 71.0° | (259) |
| | B $C_6H_5NO_3$ | *m*-Nitrophenol | 94.5 | 23,730 | − 3.372 | 60.70 | 71.0 − 94.5 | 56.9 M % B | |
| 588 | A $C_6H_3N_3O_7$ | Picric acid | 120.0 | 19,146 | − 2.542 | 164.8 | 79.0 − 120.0 | 79.0° | (259) |
| | B $C_6H_5NO_3$ | *p*-Nitrophenol | 113.0 | 22,690 | − 3.069 | 60.7 | 79.0 − 113.0 | 50.0 M % B | |
| 594 | A $C_6H_3N_3O_7$ | Picric acid | 122.0 | 18,070 | − 2.389 | 100.9 | 59.7 − 122.0 | 59.7° | (43, 134, 446) |
| | B $C_7H_5N_3O_6$ | Trinitrotoluene | 80.3 | 20,880 | − 3.082 | 99.13 | 59.7 − 80.3 | 64.0 M % B | |
| 596 | A $C_6H_3N_3O_7$ | Picric acid | 121.8 | 19,530 | − 2.582 | 125.8 | 65.0 − 121.8 | 53.3° | (43) |
| | B $C_7H_6N_2O_4$ | 2, 4-Dnitrotoluene | 69.5 | 21,060 | − 3.211 | 79.52 | 53.3 − 69.5 | 69.0 M % B | |
| 656 | A $C_6H_4BrCl$ | *o*-Bromochlorobenzene | −12.1 | 12,250 | − 2.451 | 100 | − 18.6 − −12.1 | −18.6° | (181) |
| | B $C_6H_4BrCl$ | *p*-Bromochlorobenzene | 64.6 | 18,510 | − 2.862 | 100 | 25.0 − 64.6 | 13.3 M % B | |
| 661 | A $C_6H_4BrNO_2$ | *o*-Bromonitrobenzene | 38.5 | 16,875 | − 2.829 | 100 | 16.85− 38.5 | 16.85° | (350) |
| | B $C_6H_4BrNO_2$ | *m*-Bromonitrobenzene | 52.56 | 20,710 | − 3.322 | 100 | 16.85− 52.56 | 38.7 M % B | |
| 662 | A $C_6H_4BrNO_2$ | *o*-Bromonitrobenzene | 38.5 | 19,240 | − 3.225 | 100 | 34.24− 38.5 | 34.24° | (160, 350) |
| | B $C_6H_4BrNO_2$ | *p*-Bromonitrobenzene | 124.92 | 24,310 | − 3.190 | 100 | 45.0 − 124.92 | 10.6 M % B | |
| 664 | A $C_6H_4BrNO_2$ | *o*-Bromonitrobenzene | 38.5 | 21,380 | − 3.584 | 265.2 | − 8.7 − 38.5 | −8.7° | (47) |
| | B $C_6H_6$ | Benzene | 5.5 | 11,500 | − 2.152 | 37.72 | − 8.7 − 5.5 | 77.0 M % B | |
| 665 | A $C_6H_4BrNO_2$ | *m*-Bromonitrobenzene | 52.56 | 20,200 | − 3.223 | 100 | 44.75− 52.56 | 44.75° | (350) |
| | B $C_6H_4BrNO_2$ | *p*-Bromonitrobenzene | 124.92 | 22,730 | − 2.983 | 100 | 44.75− 124.92 | 17.5 M % B | |
| 669 | A $C_6H_4BrNO_2$ | *m*-Bromonitrobenzene | 52.6 | 25,740 | − 4.130 | 265.2 | − 3.1 − 52.6 | −3.1° | (47) |
| | B $C_6H_6$ | Benzene | 5.5 | 11,500 | − 2.152 | 37.72 | − 3.1 − 5.5 | 86.0 M % B | |
| 671 | A $C_6H_4BrNO_2$ | *p*-Bromonitrobenzene | 124.3 | 27,660 | − 3.636 | 265.2 | 50.0 − 124.3 | 3.7° | (47) |
| | B $C_6H_6$ | Benzene | 5.5 | 11,500 | − 2.152 | 37.72 | 3.7 − 5.5 | 97.0 M % B | |
| 672 | A $C_6H_4Br_2$ | *o*-Dibromobenzene | 6.7 | 13,970 | − 2.609 | 100 | 0.3 − 6.7 | 0.3° | (181) |
| | B $C_6H_4Br_2$ | *p*-Dibromobenzene | 86.7 | 20,010 | − 2.903 | 100 | 20.0 − 86.7 | 13.0 M % B | |
| 673 | A $C_6H_4Br_2$ | *p*-Dibromobenzene | 88.3 | 23,510 | − 3.399 | 149.7 | 34.0 − 88.3 | 34.0° | (379.5) |
| | B $C_6H_4ClNO_2$ | *m*-Chloronitrobenzene | 45.5 | 20,010 | − 3.280 | 66.79 | 34.0 − 45.5 | 75.0 M % B | |
| 677 | A $C_6H_4Br_2$ | *p*-Dibromobenzene | 87.0 | 20,290 | − 2.944 | 150.3 | 5.0 − 87.0 | | (419) |
| | B $C_6H_5Br$ | Bromobenzene | | | | | | | |
| 678 | A $C_6H_4Br_2$ | *p*-Dibromobenzene | 89.0 | 24,500 | − 3.536 | 191.7 | 20.0 − 89.0 | | (244) |
| | B $C_6H_5NO_2$ | Nitrobenzene | | | | | | | |
| 679 | A $C_6H_4Br_2$ | *p*-Dibromobenzene | 87.0 | 21,070 | − 3.055 | 302.4 | 10.0 − 87.0 | | (344, 418) |
| | B $C_6H_6$ | Benzene | | | | | | | |
| 680 | A $C_6H_4Br_2$ | *p*-Dibromobenzene | 89.0 | 30,950 | − 4.466 | 253.5 | 20.0 − 89.0 | | (344) |
| | B $C_6H_7N$ | Aniline | | | | | | | |
| 682 | A $C_6H_4Br_2$ | *p*-Dibromobenzene | 89.0 | 20,800 | − 3.001 | 256.2 | 10.0 − 89.0 | | (344) |
| | B $C_7H_8$ | Toluene | | | | | | | |
| 687 | A $C_6H_4ClNO_2$ | *o*-Chloronitrobenzene | 32.09 | 16,805 | − 2.875 | 100 | 14.65− 32.09 | 14.65° | (181) |
| | B $C_6H_4ClNO_2$ | *p*-Chloronitrobenzene | 82.15 | 14,640 | − 2.152 | 100 | 35.0 − 82.15 | 33.1 M % B | |
| 688 | A $C_6H_4ClNO_2$ | *o*-Chloronitrobenzene | 31.5 | 21,540 | − 3.695 | 201.8 | − 10.6 − 31.5 | −10.6° | (47) |
| | B $C_6H_6$ | Benzene | 5.5 | 11,190 | − 2.199 | 49.55 | − 10.6 − 5.5 | 74.5 M % B | |
| 693 | A $C_6H_4ClNO_2$ | *m*-Chloronitrobenzene | 43.7 | 24,510 | − 4.040 | 201.8 | − 5.7 − 43.7 | −5.7° | (47) |
| | B $C_6H_6$ | Benzene | 5.5 | 11,190 | − 2.199 | 49.55 | − 5.7 − 5.5 | 82.2 M % B | |
| 697 | A $C_6H_4ClNO_2$ | *p*-Chloronitrobenzene | 82.3 | 17,240 | − 2.533 | 201.8 | − 4.0 − 82.3 | −4.0° | (47) |
| | B $C_6H_6$ | Benzene | 5.5 | 11,190 | − 2.199 | 49.55 | − 4.0 − 5.5 | 84.7 M % B | |
| 701 | A $C_6H_4Cl_2$ | *o*-Dichlorobenzene | −17.5 | 13,205 | − 2.699 | 100 | − 23.4 − −17.5 | −23.4° | (181) |
| | B $C_6H_4Cl_2$ | *p*-Dichlorobenzene | 52.6 | 18,010 | − 2.889 | 100 | − 23.4 − 52.6 | 13.3 M % B | |
| 703 | A $C_6H_4Cl_2O_4S_2$ | *m*-Benzenedisulfonyl chloride | 60.0 | 18,180 | − 2.851 | 100 | 46.2 − 60.0 | 46.2° | (175) |
| | B $C_6H_4Cl_2O_4S_2$ | *p*-Benzenedisulfonyl chloride | 140.8 | 14,550 | − 1.836 | 100 | 71.0 − 140.8 | 24.6 M % B | |
| 707 | A $C_6H_4INO_2$ | *o*-Iodonitrobenzene | 54.0 | | | | | 46.6° | (162, 171) |
| | B $C_6H_4INO_2$ | *p*-Iodonitrobenzene | 173.1 | 26,410 | − 3.091 | 100 | 60.0 − 173.1 | *ca.* 5.0 M % B | |
| 708 | A $C_6H_4N_2O_4$ | *o*-Dinitrobenzene | 116.5 | 22,490 | − 3.016 | 100 | 80.0 − 116.5 | 64.0° | (43) |
| | B $C_6H_4N_2O_4$ | *m*-Dinitrobenzene | 89.9 | 16,940 | − 2.458 | 100 | 64.0 − 89.9 | 65.0 M % B | |
| 709 | A $C_6H_4N_2O_4$ | *o*-Dinitrobenzene | 116.5 | 33,500 | − 4.492 | 215.4 | 50.0 − 116.5 | 4.3°† | (228) |
| | B $C_6H_6$ | Benzene | 5.2 | | | | | 98.0 M % B | |
| 714 | A $C_6H_4N_2O_4$ | *o*-Dinitrobenzene | 116.5 | 22,880 | − 3.068 | 74.05 | 63.8 − 116.5 | 63.8° | (43) |
| | B $C_7H_5N_3O_6$ | 2, 4, 6-Trinitrotoluene | 80.2 | 25,520 | − 3.772 | 135.2 | 63.8 − 80.2 | 66.0 M % B | |
| 716 | A $C_6H_4N_2O_4$ | *o*-Dinitrobenzene | 116.5 | 22,590 | − 3.030 | 92.28 | 55.4 − 116.5 | 55.4° | (45) |
| | B $C_7H_6N_2O_4$ | 2, 4-Dinitrotoluene | 69.5 | 21,630 | − 3.299 | 108.4 | 55.4 − 96.5 | 72.6 M % B | |

* 33.7 M % B at 60°.

† 2.5 M % A at 20°, 5.3 M % B at 35°.

Equations.—(*Continued*)

| No. | Formula | Name | M. P. | a | b | c | Range, °C | Eut. temp. and % | Lit. |
|---|---|---|---|---|---|---|---|---|---|
| 719 | A $C_6H_4N_2O_4$ | *o*-Dinitrobenzene | 116.0 | 23,350 | − 3.135 | 131.3 | 62.0 − 116.0 | 62.0° | (259) |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 21,050 | − 3.112 | 76.17 | 62.0 − 80.1 | 68.0 M % B | |
| 720 | A $C_6H_4N_2O_4$ | *o*-Dinitrobenzene | 116.5 | 20,800 | − 2.790 | 117.5 | 90.0 − 116.5 | 30.2°* | (237) |
| | B $C_{10}H_9N$ | α-Naphthylamine | 48.0 | 12,250 | − 1.992 | 85.1 | 30.2 − 48.0 | 76.4 M % B | |
| 721 | A $C_6H_4N_2O_4$ | *o*-Dinitrobenzene | 116.5 | 20,800 | − 2.790 | 117.5 | 90.0 − 116.5 | 73.5° | (237) |
| | B $C_{10}H_9N$ | β-Naphthylamine | 109.0 | 19,880 | − 2.718 | 85.1 | 73.5 − 109.0 | 52.8 M % B | |
| 723 | A $C_6H_4N_2O_4$ | *o*-Dinitrobenzene | 116.5 | 23,600 | − 3.163 | 109.1 | 71.5 − 116.5 | 71.5° | (239) |
| | B $C_{12}H_{10}$ | Acenaphthene | 92.5 | 24,260 | − 3.468 | 91.7 | 71.5 − 92.5 | 61.5 M % B | |
| 724 | A $C_6H_4N_2O_4$ | *o*-Dinitrobenzene | 116.5 | 22,280 | − 2.937 | 101.2 | 78.0 − 116.5 | 78.0° | (230) |
| | B $C_{13}H_{10}$ | Fluorene | 112.5 | 20,100 | − 2.723 | 98.8 | 78.0 − 112.5 | 53.0 M % B | |
| 726 | A $C_6H_4N_2O_4$ | *o*-Dinitrobenzene | 116.5 | 26,150 | − 3.515 | 94.4 | 75.0 − 116 | 75.0° | (228) |
| | B $C_{14}H_{10}$ | Phenanthrene | 103.0 | 18,800 | − 2.614 | 105.9 | 75.0 − 103.0 | 61.0 Wt. % B | |
| 730 | A $C_6H_4N_2O_4$ | *m*-Dinitrobenzene | 89.8 | 20,590 | − 2.921 | 215.4 | − 0.8 − 89.8 | −0.8° | (228, 419) |
| | B $C_6H_6$ | Benzene | 5.2 | 11,500 | − 2.155 | 46.43 | − 0.8 − 5.2 | 89.3 M % B | |
| 738 | A $C_6H_4N_2O_4$ | *m*-Dinitrobenzene | 89.9 | 16,930 | − 2.436 | 74.05 | 52.3 − 89.9 | 52.3° | (43, 130) |
| | B $C_7H_5N_3O_6$ | 2, 4, 6-Trinitrotoluene | 80.3 | 25,510 | − 3.770 | 135.1 | 52.3 − 80.3 | 47.5 M % B | |
| 739 | A $C_6H_4N_2O_4$ | *m*-Dinitrobenzene | 89.9 | 17,550 | − 2.524 | 92.28 | 44.9 − 89.9 | 44.9° | (43, 130) |
| | B $C_7H_6N_2O_4$ | 2, 4-Dinitrotoluene | 69.5 | 21,630 | − 3.299 | 108.4 | 44.9 − 69.5 | 56.0 M % B | |
| 741 | A $C_6H_4N_2O_4$ | *m*-Dinitrobenzene | 89.4 | 17,570 | − 2.531 | 122.7 | 40.0 − 89.4 | 29.7° | (130) |
| | B $C_7H_7NO_2$ | *p*-Nitrotoluene | 51.4 | 15,410 | − 2.480 | 81.52 | 29.7 − 51.4 | 66.5 M % B | |
| 743 | A $C_6H_4N_2O_4$ | *m*-Dinitrobenzene | 90.2 | 23,000 | − 3.307 | 124.4 | 68.5 − 90.2 | 68.5° | (82) |
| | B $C_8H_9NO$ | Acetanilide | 113.5 | 23,570 | − 3.186 | 80.35 | 68.5 − 113.5 | 38.5 M % B | |
| 751 | A $C_6H_4N_2O_4$ | *m*-Dinitrobenzene | 89.0 | 17,640 | − 2.547 | 101.2 | 70.0 − 89.0 | 54.0° | (230) |
| | B $C_{13}H_{10}$ | Fluorene | 112.5 | 17,420 | − 2.236 | 98.8 | 70.0 − 112.5 | 42.2 M % B | |
| 753 | A $C_6H_4N_2O_4$ | *m*-Dinitrobenzene | 89.5 | 16,940 | − 2.441 | 94.4 | 60.0 − 89.5 | 48.5° | (228) |
| | B $C_{14}H_{10}$ | Phenanthrene | 103.5 | 15,020 | − 2.909 | 105.9 | 60.0 − 103.5 | 49.0 Wt. % B | |
| 766 | A $C_6H_4N_2O_4$ | *p*-Dinitrobenzene | 169.5 | 23,930 | − 2.824 | 109.1 | 90.0 − 169.5 | 81.5° | (239) |
| | B $C_{12}H_{10}$ | Acenaphthene | 92.5 | 22,300 | − 3.188 | 91.7 | 81.5 − 92.5 | 80.0 M % B | |
| 767 | A $C_6H_4N_2O_4$ | *p*-Dinitrobenzene | 172.0 | 25,840 | − 3.033 | 101.2 | 130.0 − 172.0 | 90.0° | (230) |
| | B $C_{13}H_{10}$ | Fluorene | 112.5 | 17,420 | − 2.336 | 98.8 | 95.0 − 112.5 | 72.0 M % B | |
| 768 | A $C_6H_4N_2O_4$ | *p*-Dinitrobenzene | 171.5 | 24,730 | − 2.905 | 94.35 | 146.0 − 171.5 | 146.0° | (252) |
| | B $C_{14}H_{10}$ | Anthracene | 212.5 | 27,500 | − 2.960 | 106.0 | 146.0 − 212.5 | 35.0 Wt. % B | |
| 772 | A $C_6H_4N_2O_5$ | 2, 4-Dinitrophenol | 112.5 | 23,730 | − 3.217 | 132.4 | 50.0 − 112.5 | 36.5° | (82) |
| | B $C_6H_5NO_3$ | *o*-Nitrophenol | 46.2 | 17,890 | − 2.926 | 75.54 | 36.5 − 46.2 | 81.5 M % B | |
| 781 | A $C_6H_4N_2O_5$ | 2, 4-Dinitrophenol | 112.5 | 25,760 | − 3.492 | 136.25 | 79.0 − 112.5 | 79.0° | (82) |
| | B $C_8H_9NO$ | Acetanilide | 113.5 | 19,300 | − 2.609 | 73.35 | 79.0 − 113.5 | 56.0 M % B | |
| 791 | A $C_6H_4N_2O_5$ | 2, 4-Dinitrophenol | 112.0 | 22,300 | − 3.024 | 110.8 | 74.0 − 112.0 | 74.0° | (230) |
| | B $C_{13}H_{10}$ | Fluorene | 112.5 | 17,540 | − 2.366 | 90.24 | 74.0 − 112.5 | 54.8 M % B | |
| 793 | A $C_6H_4N_2O_5$ | 2, 4-Dinitrophenol | 111.0 | | | | | 101.0° | (252) |
| | B $C_{14}H_{10}$ | Anthracene | 213.0 | 24,820 | − 2.668 | 96.8 | 101.0 − 213.0 | 15.5 Wt. % B | |
| 822 | A $C_6H_5BrO$ | *o*-Bromophenol | 5.5 | 10,910 | − 2.049 | 100 | − 11.7 − 5.5 | −11.7° | (183) |
| | B $C_6H_5BrO$ | *p*-Bromophenol | 63.5 | 14,200 | − 2.203 | 100 | 20.0 − 63.5 | 27.2 M % B | |
| 825 | A $C_6H_5Cl$ | Chlorobenzene | −45 | 8,770 | − 2.008 | 80.06 | − 54.2 − −45.0 | −54.2° | (331) |
| | B $C_7H_5ClO$ | Benzoyl chloride | − 0.5 | 14,560 | − 2.790 | 124.9 | − 40.0 − −0.5 | 18.0 M % B | |
| 827 | A $C_6H_5Cl$ | Chlorobenzene | | | | | | | (112, 419, 436) |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 18,200 | − 2.690 | 113.9 | − 10.0 − 80.1 | | 475) |
| 829 | A $C_6H_5Cl$ | Chlorobenzene | | | | | | | (345) |
| | B $C_{12}H_{10}$ | Acenaphthene | 95.0 | 21,820 | − 3.098 | 137.0 | 10.0 − 95.0 | | |
| 830 | A $C_6H_5Cl$ | Chlorobenzene | | | | | | | (147.6) |
| | B $C_{13}H_{10}$ | Fluorene | 114.5 | 21,150 | − 2.851 | 147.6 | 40.0 − 114.5 | † | |
| 831 | A $C_6H_5Cl$ | Chlorobenzene | | | | | | | (475) |
| | B $C_{14}H_{10}$ | Anthracene | 216.5 | 27,470 | − 2.807 | 158.4 | 25.0 − 120.0 | | |
| 832 | A $C_6H_5Cl$ | Chlorobenzene | | | | | | | (475) |
| | B $C_{14}H_{10}$ | Phenanthrene | 99.0 | 18,410 | − 2.587 | 158.3 | 10.0 − 80.0 | | |
| 834 | A $C_6H_5ClO$ | *o*-Chlorophenol | 8.8 | 10,260 | − 1.901 | 100 | − 10.0 − 8.8 | −20.5° | (183) |
| | B $C_6H_5ClO$ | *p*-Chlorophenol | 42.9 | 11,160 | − 1.844 | 100 | 20.0 − 42.9 | 38.5 M % B‡ | |
| 844 | A $C_6H_5IO$ | *o*-Iodophenol | 40.4 | 18,810 | − 3.135 | 100 | 26.1 − 40.4 | 26.1° | (183) |
| | B $C_6H_5IO$ | *p*-Iodophenol | 92.7 | 18,700 | − 2.670 | 100 | 60.0 − 92.7 | 29.5 M % B | |
| 848 | A $C_6H_5NO_2$ | Nitrobenzene | 5.3 | 13,220 | − 2.481 | 157.6 | − 15.0 − 5.3 | −24.6° | (86, 430) |
| | B $C_6H_6$ | Benzene | 5.5 | 12,975 | − 2.432 | 63.43 | − 24.6 − 5.5 | 51.0 M % B | |
| 850 | A $C_6H_5NO_2$ | Nitrobenzene | 5.3 | 13,210 | − 2.477 | 89.12 | 1.0 − 5.3 | 1.0° | (48) |
| | B $C_6H_6N_2O_2$ | *o*-Nitroaniline | 71.1 | 27,090 | − 4.110 | 112.2 | 10.0 − 71.1 | 8.5 M % B | |
| 851 | A $C_6H_5NO_2$ | Nitrobenzene | 5.3 | 13,210 | − 2.477 | 89.12 | 2.0 − 5.3 | 2.0° | (48) |
| | B $C_6H_6N_2O_2$ | *m*-Nitroaniline | 112.0 | 26,510 | − 3.598 | 112.2 | 50.0 − 112.0 | 6.3 M % B | |
| 852 | A $C_6H_5NO_2$ | Nitrobenzene | 5.3 | 13,210 | − 2.477 | 89.12 | 2.5 − 5.3 | 2.5° | (48) |
| | B $C_6H_6N_2O_2$ | *p*-Nitroaniline | 149.0 | 24,210 | − 2.998 | 112.2 | 60.0 − 149.0 | 5.5 M % B | |
| 853 | A $C_6H_5NO_2$ | Nitrobenzene | 5.3 | 15,310 | − 2.871 | 130.8 | − 16.5 − 5.3 | −16.5° | (86, 345) |
| | B $C_6H_6O$ | Phenol | 40.5 | 10,775 | − 1.795 | 76.43 | 5.0 − 40.5 | 43.0 M % B | |
| 857 | A $C_6H_5NO_2$ | Nitrobenzene | 6.0 | 13,930 | − 2.608 | 87.58 | − 20.3 − 6.0 | −20.3° | (331) |
| | B $C_7H_5ClO$ | Benzoyl chloride | − 0.5 | 22,020 | − 4.218 | 114.2 | − 20.3 − −0.5 | 46.6 M % B | |
| 858 | A $C_6H_5NO_2$ | Nitrobenzene | | | | | | | (344) |
| | B $C_7H_6O_2$ | Benzoic acid | | 23,070 | − 3.055 | 99.20 | 10.0 − 80.0 | | |
| 861 | A $C_6H_5NO_2$ | Nitrobenzene | 5.3 | 13,210 | − 2.477 | 96.1 | − 3.0 − 5.3 | −3.0° | (222, 475) |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 19,240 | − 2.845 | 104.1 | 20.0 − 80.1 | 15.5 M % B§ | |

* 33.3 M % A at 50°, 45.4 M % A at 70°.
† 7.6 M % B at 0°, 12.9 M % B at 20°.
‡ 52.5 M % B at 0°.
§ 20.6 M % B at 10°.

**Equations.**—(*Continued*)

| No. | Formula | Name | M. P. | a | b | c | Range, °C | Eut. temp. and % | Lit. |
|---|---|---|---|---|---|---|---|---|---|
| 863 | A $C_6H_5NO_2$ | Nitrobenzene | | | | | | | (475) |
| | B $C_{12}H_9N$ | Carbazole | 245.2 | 24,010 | − 2.397 | 135.7 | 20.0 − 180.0 | | |
| 864 | A $C_6H_5NO_2$ | Nitrobenzene | | | | | | | (345) |
| | B $C_{12}H_{10}$ | Acenaphthene | 95.0 | 22,870 | − 3.246 | 125.2 | 10.0 − 95.0 | | |
| 866 | A $C_6H_5NO_2$ | Nitrobenzene | | | | | | | (345) |
| | B $C_{13}H_{10}$ | Fluorene | 114.5 | 21,380 | − 2.880 | 135.0 | 10.0 − 114.5 | | |
| 867 | A $C_6H_5NO_2$ | Nitrobenzene | | | | | | | (475) |
| | B $C_{14}H_8O_2$ | Anthraquinone | 285.2 | 29,780 | − 2.634 | 169.0 | 25.0 − 190.0 | | |
| 868 | A $C_6H_5NO_2$ | Nitrobenzene | | | | | | | (475) |
| | B $C_{14}H_{10}$ | Anthracene | 216.5 | 29,010 | − 3.134 | 144.7 | 5.0 − 175.0 | | |
| 868.1 | A $C_6H_5NO_2$ | Nitrobenzene | | | | | | | (475) |
| | B $C_{14}H_{10}$ | Phenanthrene | 99.0 | 16,640 | − 2.338 | 144.8 | 5.0 − 85.0 | | |
| 869 | A $C_6H_5NO_2$ | *o*-Nitrophenol | 44.0 | 20,520 | − 3.380 | 100 | 31.5 − 44.0 | 31.5° | (71) |
| | B $C_6H_5NO_2$ | *m*-Nitrophenol | 94.0 | 19,300 | − 2.747 | 100 | 31.5 − 94.0 | 27.5 M % B | |
| 870 | A $C_6H_5NO_2$ | *o*-Nitrophenol | 44.0 | 21,050 | − 3.470 | 100 | 33.5 − 44.0 | 33.5° | (71) |
| | B $C_6H_5NO_2$ | *p*-Nitrophenol | 114.0 | 17,300 | − 2.334 | 100 | 33.5 − 114.0 | 24.5 M % B | |
| 881 | A $C_7H_7NO_2$ | *o*-Nitrophenol | 44.5 | 17,980 | − 2.953 | 129.8 | 15.0 − 44.5 | 15.0° | (379, 381) |
| | B $C_7H_9N$ | *p* Toluidine | 37.5 | 18,025 | − 2.975 | 77.04 | 15.0 − 43.3 | 51.0 M % B | |
| 884 | A $C_6H_5NO_2$ | *o*-Nitrophenol | 45.0 | 20,960 | − 3.442 | 108.6 | 29.0 − 45.0 | 29.0° | (222, 410) |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 18,790 | − 2.779 | 92.1 | 29.0 − 80.1 | 34.0 M % B | |
| 885 | A $C_6H_5NO_2$ | *o*-Nitrophenol | 44.5 | 18,680 | − 3.072 | 97.18 | 20.0 − 44.5 | 14.0° | (237) |
| | B $C_{10}H_9N$ | α-Naphthylamine | 48.0 | 13,980 | − 2.276 | 102.9 | 20.0 − 48.0 | 52.0 M % B | |
| 886 | A $C_6H_5NO_2$ | *o*-Nitrophenol | 44.5 | 20,100 | − 3.310 | 97.18 | 36.3 − 44.5 | 36.3° | (237) |
| | B $C_{10}H_9N$ | β-Naphthylamine | 109.0 | 24,000 | − 3.282 | 102.9 | 36.3 − 109.0 | 16.6 M % B | |
| 891 | A $C_6H_5NO_2$ | *o*-Nitrophenol | 44.6 | | | | | 43.5° | (263) |
| | B $C_{12}H_9N$ | Carbazole | 236.0 | 27,350 | − 2.807 | 120.1 | 43.5 − 236.0 | 2.3 Wt. % B | |
| 899 | A $C_6H_5NO_2$ | *m*-Nitrophenol | 94.0 | 18,790 | − 2.673 | 100 | 61.5 − 94.0 | 61.5° | (71) |
| | B $C_6H_5NO_2$ | *p*-Nitrophenol | 114.0 | 16,305 | − 2.200 | 100 | 61.5 − 114.0 | 45.2 M % B | |
| 916 | A $C_6H_5NO_2$ | *m*-Nitrophenol | 95.0 | | | | | 92.0° | (263) |
| | B $C_{12}H_9N$ | Carbazole | 236.1 | 33,050 | − 3.395 | 120.1 | 92.0 − 236.1 | 5.5 Wt. % B | |
| 943 | A $C_6H_5NO_2$ | *p*-Nitrophenol | 111.8 | | | | | 106.7° | (263) |
| | B $C_{12}H_9N$ | Carbazole | 236.0 | 34,460 | − 3.541 | 120.1 | 106.7 − 236.0 | 7.4 M % B | |
| 948 | A $C_6H_5NO_2$ | *p*-Nitrophenol | 113.5 | | | | | 106.0° | (252) |
| | B $C_{14}H_{10}$ | Anthracene | 212.5 | 50,390 | − 5.420 | 128.1 | 150.0 − 212.5 | 6.0 Wt. % B* | |
| 954 | A $C_6H_5N_3O_4$ | 2, 4-Dinitroaniline | 179.5 | 22,520 | − 2.600 | 132.6 | 160.0 − 179.5 | | (148) |
| | B $C_6H_6N_2O_2$ | *o*-Nitroaniline | | | | | | | |
| 955 | A $C_6H_5N_3O_4$ | 2, 4-Dinitroaniline | 179.5 | 22,520 | − 2.600 | 132.6 | 117.0 − 179.5 | 117.0° | (148) |
| | B $C_6H_6N_2O_2$ | *p*-Nitroaniline | 148.3 | 20,650 | − 2.562 | 75.4 | 117.0 − 148.3 | 62.5 M % B | |
| 962 | A $C_6H_6$ | Benzene | 5.5 | 27,500 | − 5.160 | 83.0 | − 4.0 − 5.5 | −5.3° | (86, 151, 345, |
| | B $C_6H_6O$ | Phenol | 40.6 | 12,860 | − 2.142 | 120.5 | 20.0 − 40.6 | 37.0 M % B† | 375, 458) |
| 968 | A $C_6H_6$ | Benzene | 5.5 | 9,860 | − 1.849 | 59.12 | − 27.0 − 5.5 | −27.0° | (375) |
| | B $C_6H_{12}O_3$ | Paraldehyde | 12.0 | 13,475 | − 2.469 | 169.1 | − 20.0 − 12.0 | 43.0 M % B | |
| 969 | A $C_6H_6$ | Benzene | 5.5 | 11,675 | − 2.189 | 55.56 | − 20.0 − 5.5 | −26.5° | (331) |
| | B $C_7H_5ClO$ | Benzoyl chloride | − 0.5 | 15,690 | − 3.008 | 180.0 | − 20.0 − −0.5 | 51.9 M % B | |
| 979 | A $C_6H_6$ | Benzene | 5.5 | 11,330 | − 2.124 | 45.52 | − 3.3 − 5.5 | −3.3° | (292) |
| | B $C_7H_6ClNO_2$ | Nitrobenzyl chloride | 47.7 | 25,090 | − 4.085 | 219.7 | 10.0 − 47.7 | 15.0 M % B | |
| 980 | A $C_6H_6$ | Benzene | 5.2 | 11,500 | − 2.155 | 36.81 | − 0.7 − 5.2 | −0.7° | (228) |
| | B $C_7H_6N_2O_4$ | 2, 4-Dinitrotoluene | 70.7 | 24,120 | − 3.665 | 233.4 | − 0.7 − 70.7 | 10.5 M % B | |
| 981 | A $C_6H_6$ | Benzene | 5.2 | 11,500 | − 2.155 | 36.81 | 0.2 − 5.2 | 0.2° | (228) |
| | B $C_7H_6N_2O_4$ | 2, 6-Dinitrotoluene | 65.0 | 19,430 | − 3.002 | 233.4 | 40.0 − 65.0 | 10.7 M % B‡ | |
| 982 | A $C_6H_6$ | Benzene | 5.2 | 11,500 | − 2.155 | 36.81 | − 5.0 − 5.2 | −5.0° | (228) |
| | B $C_7H_6N_2O_4$ | 3, 4-Dinitrotoluene | 59.0 | 18,850 | − 2.964 | 233.4 | 25.0 − 59.0 | 24.5M % B§ | |
| 991 | A $C_6H_6$ | Benzene | 5.48 | 10,320 | − 1.934 | 45.61 | − 18.5 − 5.48 | −18.5° | (375) |
| | B $C_7H_7Br$ | *p*-Bromotoluene | 26.71 | 15,405 | − 2.684 | 219.3 | − 18.5 − 26.71 | 33.6 M % B | |
| 992 | A $C_6H_6$ | Benzene | 5.5 | 9,825 | − 1.842 | 84.75 | − 70.0 − 5.5 | −99.8° | (400) |
| | B $C_7H_8$ | Toluene | −94.5 | 7,280 | − 2.115 | 118.0 | − 99.8 − −94.5 | 86.3 M % B‖ | |
| 1003 | A $C_6H_6$ | Benzene | 5.5 | 10,090 | − 1.893 | 73.6 | − 22.2 − 5.5 | −22.2° | (375, 377) |
| | B $C_8H_{10}$ | *p*-Xylene | 13.35 | 16,650 | − 3.035 | 135.9 | − 22.2 − 13.35 | 37.3 M % B | |
| 1005 | A $C_6H_6$ | Benzene | 5.5 | 10,105 | − 1.894 | 60.96 | − 3.5 − 5.5 | −3.5° | (112, 385, 419, |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 19,340 | − 2.860 | 164.1 | − 3.5 − 80.1 | 12.5 M % B | 436, 475, 476) |
| 1008 | A $C_6H_6$ | Benzene | 5.5 | 8,865 | − 1.662 | 57.35 | − 20.0 − 5.5 | −45.0° | (282) |
| | B $C_{10}H_{16}$ | Camphene | 49.3 | 2,583 | − 0.4175 | 174.4 | − 20.0 − 49.3 | 64.6 M % B¶ | |
| 1011 | A $C_6H_6$ | Benzene | 5.48 | 10,525 | − 1.974 | 50.65 | − 5.8 − 5.48 | −5.8° | (476) |
| | B $C_{12}H_{10}$ | Diphenyl | 68.95 | 17,130 | − 2.615 | 197.4 | 10.0 − 68.95 | 16.8 M % B | |
| 1012 | A $C_6H_6$ | Benzene | 5.5 | 12,340 | − 2.314 | 46.14 | − 6.8 − 5.5 | −6.8° | (55, 86) |
| | B $C_{12}H_{11}N$ | Diphenylamine | 52.9 | 18,470 | − 2.959 | 216.7 | − 6.8 − 52.9 | 21.5 M % B | |
| 1013 | A $C_6H_6$ | Benzene | 5.5 | | | | | | (345) |
| | B $C_{12}H_{12}N_2$ | Hydrazobenzene | 127.0 | 28,130 | − 3.675 | 235.9 | 20.0 − 127.0 | | |
| 1014 | A $C_6H_6$ | Benzene | | | | | | | (345) |
| | B $C_{13}H_{10}$ | Fluorene | 114.5 | 22,500 | − 3.031 | 212.8 | 10.0 − 114.5 | | |
| 1016 | A $C_6H_6$ | Benzene | | | | | | | (460) |
| | B $C_{14}H_8O_2$ | Anthraquinone | 285.2 | 28,300 | − 2.004 | 266.6 | 0.0 − 80.0 | | |
| 1017 | A $C_6H_6$ | Benzene | | | | | | | (158, 460, 475) |
| | B $C_{14}H_{10}$ | Anthracene | 216.5 | 27,180 | − 2.620 | 228.2 | 0.0 − 80.0 | | |

* 11.9 Wt. % B at 130°.
† 50.5 M % B at 5.0°.
‡ 21.9 M % B at 15.0°, 41.2 M % B at 30°.
§ 33.0 M % B at 10°.
‖ 83.0 M % B at 80.0°.
¶ 44.4 M % B at −30.0°; 64.6 M % B at −30.0°.

Equations.—(*Continued*)

| No. | Formula | Name | M. P. | a | b | c | Range, °C | Eut. temp. and % | Lit. |
|---|---|---|---|---|---|---|---|---|---|
| 1018 | A $C_6H_6$ | Benzene | | | | | | | (153, 158, 475) |
| | B $C_{14}H_{10}$ | Phenanthrene | 99.0 | 19,650 | − 2.763 | 228.2 | 5.0 − 75.0 | | |
| 1020 | A $C_6H_6$ | Benzene | 5.5 | | | | | | (345) |
| | B $C_{14}H_{16}N_2$ | Hydrazotoluene | 159.0 | 33,690 | − 4.072 | 271.8 | 20 − 159.0 | | |
| 1021 | A $C_6H_6$ | Benzene | 5.5 | | | | | | (345) |
| | B $C_{14}H_{16}N_2O_2$ | Hydrazoanisole | 104.3 | 27,580 | − 3.816 | 312.8 | 20 − 104.3 | | |
| 1033 | A $C_6H_6N_2O_2$ | *m*-Nitroaniline | 114.0 | 25,300 | − 3.417 | 102.2 | 81.0 − 114.0 | 81.0° | (82) |
| | B $C_8H_9NO$ | Acetanilide | 113.5 | 30,620 | − 4.140 | 97.9 | 85.0 − 113.5 | 52.0 M % B | |
| 1050 | A $C_6H_6O$ | Phenol | 41.0 | 9,175 | − 1.525 | 77.0 | 22.0 − 41.0 | 22.0° | (258) |
| | B $C_7H_6O_2$ | *m*-Hydroxybenzaldehyde | 105.0 | 17,110 | − 2.363 | 129.8 | 30.0 − 105.0 | 20.3 M % B | |
| 1091 | A $C_6H_6O_2$ | Catechol | 103.0 | 16,880 | − 2.343 | 90.18 | 70.0 − 103.0 | 61.0° | (258) |
| | B $C_7H_6O_2$ | *m*-Hydroxybenzaldehyde | 105.0 | 16,570 | − 2.289 | 110.9 | 61.0 − 105.0 | 50.0 M % B | |
| 1103 | A $C_6H_6O_2$ | Catechol | 103.2 | | | | | 102.0° | (263) |
| | B $C_{12}H_9N$ | Carbazole | 236.0 | 43,070 | − 4.427 | 151.8 | 102.0 − 236.0 | 4.0 Wt. % B | |
| 1117 | A $C_6H_6O_2$ | Resorcinol | 115.0 | 12,490 | − 1.682 | 90.8 | 59.0 − 115.0 | 59.0° | (258) |
| | B $C_7H_6O_2$ | *m*-Hydroxybenzaldehyde | 105.0 | 16,570 | − 2.289 | 110.9 | 65.0 − 105.0 | 48.0 M % B | |
| 1132 | A $C_6H_6O_2$ | Resorcinol | 109.0 | | | | | 107.0°* | (263) |
| | B $C_{12}H_9N$ | Carbazole | 236.0 | 50,860 | − 5.227 | 151.8 | 160.0 − 236.0 | 7.0 Wt. % B | |
| 1170 | A $C_6H_6O_3$ | Pyrogallol | 132.5 | 16,550 | − 2.131 | 103.3 | 69.0 − 132.5 | 69.0° | (258) |
| | B $C_7H_6O_2$ | *m*-Hydroxybenzaldehyde | 105.0 | 15,210 | − 2.101 | 96.83 | 69.0 − 105.0 | 60.0 M % B | |
| 1179 | A $C_6H_6O_3$ | Pyrogallol | 126.5 | | | | | 126.0° | (263) |
| | B $C_{12}H_9N$ | Carbazole | 236.0 | 58,860 | − 6.047 | 132.5 | 126.0 − 236.0 | 2.9 Wt. % B | |
| 1195 | A $C_6H_7N$ | Aniline | − 5.5 | 8,810 | − 1.718 | 67.90 | − 15.7 − −5.5 | −15.7° | (222) |
| | B $C_7H_7NO_3$ | *p*-Nitrotoluene | 51.5 | 17,170 | − 2.762 | 147.3 | 10.0 − 51.5 | 15.0 M % B† | |
| 1201 | A $C_6H_7N$ | Aniline | | | | | | | (345) |
| | B $C_7H_9N$ | *p*-Toluidine | | 16,460 | − 2.714 | 115.0 | 20.0 − 43.6 | | |
| 1207 | A $C_6H_7N$ | Aniline | | | | | | | (345) |
| | B $C_{12}H_{10}$ | Acenaphthene | 95.0 | 33,120 | − 4.700 | 165.6 | 10.0 − 95.0 | | |
| 1208 | A $C_6H_7N$ | Aniline | | | | | | | (345) |
| | B $C_{13}H_{10}$ | Fluorene | 114.5 | 28,230 | − 3.808 | 178.5 | 10.0 − 114.5 | | |
| 1209 | A $C_6H_7N$ | Aniline | | | | | | | (475) |
| | B $C_{14}H_8O_2$ | Anthraquinone | 285.2 | 30,140 | − 2.759 | 223.6 | 15.0 − 170.0 | | |
| 1211 | A $C_6H_7N$ | Aniline | | | | | | | (475) |
| | B $C_{14}H_{10}$ | Phenanthrene | 99.0 | 30,350 | − 4.349 | 191.5 | 5.0 − 80.0 | | |
| 1269 | A $C_6H_{12}O_3$ | Paraldehyde | 12.0 | 13,530 | − 2.480 | 124.5 | − 14.14− 12.0 | −14.14° | (375) |
| | B $C_8H_{10}$ | *p*-Xylene | 13.35 | 17,550 | − 2.371 | 80.32 | − 5.0 − 13.35 | 43.5 M % B | |
| 1271 | A $C_6H_{14}$ | Hexane | | | | | | | (112, 419, 436) |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 33,020 | − 4.882 | 148.6 | 10.0 − 80.1 | | |
| 1280 | A $C_7H_4Cl_2O_3S$ | *sym*-Chloride of *m*-sulfobenzoic acid | 20.4 | 17,180 | − 3.059 | 100 | 8.4 − 20.4 | 8.4° | (308) |
| | B $C_7H_4Cl_2O_3S$ | *sym*-Chloride of *p*-sulfobenzoic acid | 56.7 | 19,880 | − 3.149 | 100 | 20.0 − 56.7 | 26.0 M % B | |
| 1283 | A $C_7H_5ClO$ | Benzoyl chloride | − 0.5 | 15,690 | − 3.008 | 132.4 | − 18.5 − −0.5 | −18.5° | (331) |
| | B $C_8H_{10}$ | *p*-Xylene | 13.5 | 17,880 | − 3.259 | 75.53 | − 18.5 − 13.5 | 38.2 M % B | |
| 1284 | A $C_7H_5ClO$ | Benzoyl chloride | −0.5 | 15,080 | − 2.890 | 117.0 | − 25.0 − −0.5 | −70.0°‡ | (331) |
| | B $C_9H_{12}$ | Mesitylene | −55.4 | 5,360 | − 1.287 | 85.5 | − 70.0 − −55.4 | 81.0 M % B | |
| 1285 | A $C_7H_5ClO$ | Benzoyl chloride | − 0.5 | 16,270 | − 3.118 | 91.16 | − 8.0 − −0.5 | −8.0° | (331) |
| | B $C_{12}H_{10}$ | Diphenyl | 70.5 | 18,510 | − 2.812 | 109.7 | 30.0 − 70.5 | 16.8 M % B§ | |
| 1286 | A $C_7H_5ClO$ | Benzoyl chloride | − 0.5 | 15,350 | − 2.940 | 83.56 | − 15.0 − −0.5 | −15.0° | (331) |
| | B $C_{13}H_{12}$ | Diphenylmethane | 26.0 | 19,620 | − 3.427 | 119.7 | − 15.0 − 26.0 | 31.2 M % B | |
| 1287 | A $C_7H_5ClO_2$ | *o*-Chlorobenzoic acid | 140.7 | 23,670 | − 2.989 | 100 | 120 − 140.7 | 109.9° | (50) |
| | B $C_7H_5ClO_2$ | *m*-Chlorobenzoic acid | 155.0 | 24,900 | − 3.038 | 100 | 120 − 155.0 | 43.0 M % B | |
| 1288 | A $C_7H_5ClO_2$ | *o*-Chlorobenzoic acid | 140.7 | 23,670 | − 2.989 | 100 | 132.0 − 140.7 | 132.0° | (50) |
| | B $C_7H_5ClO_2$ | *p*-Chlorobenzoic acid | 245.0 | 30,480 | − 3.072 | 100 | 150.0 − 245.0 | 14.0 M % B | |
| 1289 | A $C_7H_5ClO_2$ | *o*-Chlorobenzoic acid | 140.7 | 26,450 | − 3.340 | 128.2 | 100.0 − 140.7 | 91.2° | (50) |
| | B $C_7H_6O_2$ | Benzoic acid | 121.7 | 17,300 | − 2.290 | 77.99 | 91.2 − 121.7 | 64.5 M % B | |
| 1291 | A $C_7H_5ClO_2$ | *m*-Chlorobenzoic acid | 155.0 | 24,900 | − 3.038 | 100 | 140.9 − 155.0 | 140.9° | (50) |
| | B $C_7H_5ClO_2$ | *p*-Chlorobenzoic acid | 245.0 | 28,240 | − 2.848 | 100 | 150.0 − 245.0 | 20.0 M % B | |
| 1292 | A $C_7H_5ClO_2$ | *m*-Chlorobenzoic acid | 155.0 | 26,600 | − 3.248 | 128.2 | 110 − 155 | 95.4° | (50) |
| | B $C_7H_6O_2$ | Benzoic acid | 121.7 | 17,300 | − 2.290 | 77.99 | 95.4 − 121.7 | 68.7 M % B | |
| 1294 | A $C_7H_5ClO_2$ | *p*-Chlorobenzoic acid | 245.0 | 29,300 | − 2.961 | 128.2 | 130 − 245 | 115.0° | (50) |
| | B $C_7H_6O_2$ | Benzoic acid | 121.7 | 17,300 | − 2.290 | 77.99 | 115.0 − 121.7 | 9.0 M % B | |
| 1307 | A $C_7H_5N_3O_6$ | 2, 4, 5-Trinitrotoluene | 101.5 | 22,010 | − 3.070 | 100 | 65.0 − 101.5 | 57.5° | (130) |
| | B $C_7H_5N_3O_6$ | 2, 4, 6-Trinitrotoluene | 80.5 | 20,860 | − 3.082 | 100 | 60.0 − 80.5 | 61.0 M % B | |
| 1309 | A $C_7H_5N_3O_6$ | 2, 4, 6-Trinitrotoluene | 80.5 | 21,920 | − 3.239 | 124.6 | 45.0 − 80.5 | 45.0° | (31, 43, 129) |
| | B $C_7H_6N_2O_4$ | 2, 4-Dinitrotoluene | 70.1 | 18,950 | − 2.884 | 80.22 | 55.0 − 70.1 | 57.0 M % B | |
| 1310 | A $C_7H_5N_3O_6$ | 2, 4, 6-Trinitrotoluene | 80.5 | 20,860 | − 3.082 | 124.6 | 50 − 80.5 | 37.5° | (129) |
| | B $C_7H_6N_2O_4$ | 2, 6-Dinitrotoluene | 65.0 | 16,780 | − 2.593 | 80.22 | 50 − 65.0 | 61.0 M % B | |
| 1312 | A $C_7H_5N_3O_6$ | 2, 4, 6-Trinitrotoluene | 80.5 | 21,340 | − 3.152 | 165.6 | 45 − 80.5 | −9.7° | (30) |
| | B $C_7H_7NO_2$ | *o*-Nitrotoluene | − 4.0 | 14,260 | − 2.766 | 60.37 | − 9.7 − −4.0 | 87.6 M % B‖ | |
| 1313 | A $C_7H_5N_3O_6$ | 2, 4, 6-Trinitrotoluene | 80.5 | 21,920 | − 3.239 | 165.6 | 40 − 80.5 | 33.9° | (31, 130) |
| | B $C_7H_7NO_2$ | *p*-Nitrotoluene | 51.4 | 16,075 | − 2.589 | 60.37 | 35 − 51.4 | 69.0 M % B | |
| 1333 | A $C_7H_6ClNO$ | *o*-Chloroformanilide | 78.0 | 18,080 | − 2.690 | 100 | 54.9 − 78.0 | 54.9° | (215) |
| | B $C_7H_6ClNO$ | *p*-Chloroformanilide | 103.0 | 22,300 | − 3.098 | 100 | 54.9 − 103.0 | 35.3 M % B | |
| 1334 | A $C_7H_6ClNO_2$ | 2-Chloro-3-nitrotoluene | 22.1 | 14,960 | − 2.648 | 100 | 8.2 − 22.1 | 8.2° | (479) |
| | B $C_7H_6ClNO_2$ | 2-Chloro-4-nitrotoluene | 62.3 | 18,080 | − 2.817 | 100 | 30.0 − 62.3 | 26.0 M % B | |
| 1335 | A $C_7H_6ClNO_2$ | 2-Chloro-3-nitrotoluene | 22.1 | 15,020 | − 2.657 | 100 | 5.0 − 22.1 | −1.0° | (479) |
| | B $C_7H_6ClNO_2$ | 2-Chloro-5-nitrotoluene | 42.9 | 14,160 | − 2.340 | 100 | 10.0 − 42.9 | 41.0 M % B | |

* 8.0 Wt. % B at 120°; 11.3 Wt. % B at 140.0°.

† 24.1 M % B at −5.0°.

‡ 36.1 M % A at −40.0°, 26.1 M % A at −55.0°.

§ 21.4 M % B at 0.0°; 30.1 M % B at 15.0°.

‖ 30.0 M % A at 27.7°; 20.0 M % B at 10°.

Equations.—(*Continued*)

| No. | Formula | Name | M. P. | a | b | c | Range, °C | Eut. temp. and % | Lit. |
|---|---|---|---|---|---|---|---|---|---|
| 1337 | A $C_7H_6ClNO_2$ | 2-Chloro-3-nitrotoluene | 23.4 | 13,680 | − 2.410 | 100 | 0 − 23.4 | −5.0° | (480) |
| | B $C_7H_6ClNO_2$ | 3-Chloro-4-nitrotoluene | 24.2 | 16,800 | − 2.952 | 100 | 5 − 24.2 | 45.0 M % B | |
| 1338 | A $C_7H_6ClNO_2$ | 2-Chloro-3-nitrotoluene | 23.4 | 13,680 | − 2.410 | 100 | − 5.4 − 23.4 | −5.4° | (480) |
| | B $C_7H_6ClNO_2$ | 3-Chloro-6-nitrotoluene | 24.9 | 17,350 | − 3.041 | 100 | − 5.4 − 24.9 | 45.0 M % B | |
| 1340 | A $C_7H_6ClNO_2$ | 2-Chloro-4-nitrotoluene | 62.3 | 18,080 | − 2.817 | 100 | 30 − 62.3 | 17.0° | (479) |
| | B $C_7H_6ClNO_2$ | 2-Chloro-6-nitrotoluene | 35.3 | 16,110 | − 2.729 | 100 | 20 − 35.3 | 66.0 M % B | |
| 1341 | A $C_7H_6ClNO_2$ | 2-Chloro-5-nitrotoluene | 42.9 | 14,160 | − 2.310 | 100 | 20 − 42.9 | 6.4° | (479) |
| | B $C_7H_6ClNO_2$ | 2-Chloro-6-nitrotoluene | 35.3 | 16,070 | − 2.722 | 100 | 6.4 − 35.3 | 52.0 M % B | |
| 1342 | A $C_7H_6ClNO_2$ | 3-Chloro-4-nitrotoluene | 24.2 | 18,025 | − 3.168 | 100 | 5.0 − 24.2 | 3.4° | (480) |
| | B $C_7H_6ClNO_2$ | 3-Chloro-6-nitrotoluene | 24.9 | 20,000 | − 3.508 | 100 | 10.0 − 24.9 | 48.0 M % B | |
| 1343 | A $C_7H_6ClNO_2$ | 4-Chloro-2-nitrotoluene | 30.0 | 19,720 | − 3.400 | 100 | − 8.1 − 30.0 | −8.1° | (170) |
| | B $C_7H_6ClNO_2$ | 4-Chloro-3-nitrotoluene | 6.5 | 15,880 | − 2.968 | 100 | − 8.1 − 6.5 | 68.4 M % B | |
| 1346 | A $C_7H_8N_2O_3$ | *o*-Nitroformanilide | 122.4 | 24,700 | − 3.261 | 100 | 112.3 − 122.4 | 112.3° | (148) |
| | B $C_7H_6N_2O_3$ | *p*-Nitroformanilide | 195.1 | 31,950 | − 3.523 | 100 | 112.3 − 195.1 | 17.7 M % B | |
| 1347 | A $C_7H_6N_2O_4$ | 2, 4-Dinitrotoluene | 70.1 | 18,510 | − 2.816 | 100 | 33.6 − 70.1 | 33.6° | (129) |
| | B $C_7H_6N_2O_4$ | 2, 6-Dinitrotoluene | 65.0 | 16,780 | − 2.593 | 100 | 33.6 − 65.0 | 54.0 M % B | |
| 1349 | A $C_7H_6N_2O_4$ | 2, 4-Dinitrotoluene | 70.1 | 17,825 | − 2.712 | 132.9 | 15 − 70.1 | −11.45° | (30) |
| | B $C_7H_7NO_2$ | *o*-Nitrotoluene | − 4.45 | 14,260 | − 2.766 | 75.25 | − 11.45− −4.45 | 84.2 M % B* | |
| 1350 | A $C_7H_6N_2O_4$ | 2, 4-Dinitrotoluene | 70.1 | 17,825 | − 2.712 | 132.9 | 30 − 70.1 | 26.5° | (31, 129) |
| | B $C_7H_7NO_2$ | *p*-Nitrotoluene | 51.4 | 16,075 | − 2.589 | 75.25 | 26.5 − 51.4 | 60.0 M % B | |
| 1358 | A $C_7H_6N_2O_4$ | 2, 4-Dinitrotoluene | 69.0 | 21,820 | − 3.332 | 109.6 | 55 − 69.0 | 44.0° | (230) |
| | B $C_{13}H_{10}$ | Fluorene | 112.5 | 17,375 | − 2.330 | 91.2 | 80 − 112.5 | 40.0 M % B† | |
| 1362 | A $C_7H_6N_2O_4$ | 2, 6-Dinitrotoluene | 65.0 | 16,740 | − 2.588 | 132.9 | 30 − 65 | | (130) |
| | B $C_7H_7NO_2$ | *p*-Nitrotoluene | 51.4 | 16,080 | − 2.588 | 75.25 | 30 − 51.4 | | |
| 1384 | A $C_7H_7N_2O_5$ | 2, 4-Dinitroanisole | 86.9 | 19,620 | − 2.847 | 93.42 | 53.5 − 86.9 | 53.5° | (41) |
| | B $C_8H_9N_2O_5$ | 2, 4-Dinitrophenetole | 85.0 | 22,210 | − 3.240 | 107.0 | 53.5 − 85.0 | 49.0 M % B | |
| 1385 | A $C_7H_6O_2$ | *m*-Hydroxybenzaldehyde | 105.0 | 19,530 | − 2.698 | 100 | 83.0 − 105.0 | 83.0° | (258) |
| | B $C_7H_6O_2$ | Benzoic acid | 121.5 | 30,430 | − 4.030 | 100 | 95.0 − 121.5 | 33.0 M % B | |
| 1386 | A $C_7H_6O_2$ | *m*-Hydroxybenzaldehyde | 105.0 | 16,550 | − 2.287 | 88.40 | 90.0 − 105.0 | 90.0° | (258) |
| | B $C_7H_6O_2$ | Salicylic acid | 159.5 | 30,530 | − 3.689 | 113.1 | 90.0 − 159.5 | 20.0 M % B | |
| 1387 | A $C_7H_6O_2$ | *m*-Hydroxybenzaldehyde | 105.0 | 18,570 | − 2.564 | 84.70 | 61.5 − 105.0 | 61.5° | (258) |
| | B $C_{10}H_8O$ | α-Naphthol | 96.0 | 18,500 | − 2.619 | 118.0 | 61.5 − 96.0 | 54.0 M % B | |
| 1388 | A $C_7H_6O_2$ | *m*-Hydroxybenzaldehyde | 105.0 | 18,180 | − 2.510 | 84.70 | 74.0 − 105.0 | 74.0° | (258) |
| | B $C_{10}H_8O$ | β-Naphthol | 121.5 | 20,100 | − 2.661 | 118.0 | 85.0 − 121.5 | 40.7 M % B | |
| 1396 | A $C_7H_6O_2$ | Benzoic acid | 121.4 | 19,550 | − 2.589 | 81.32 | 50.0 − 121.4 | 27.3° | (213) |
| | B $C_8H_6O_3$ | Piperonal | 35.5 | 18,180 | − 3.078 | 123.0 | 27.3 − 35.5 | 82.8 M % B | |
| 1397 | A $C_7H_6O_2$ | Benzoic acid | 121.4 | 18,280 | − 2.420 | 101.7 | 10.0 − 121.4 | | (344) |
| | B $C_8H_8O$ | Acetophenone | | | | | | | |
| 1400 | A $C_7H_6O_2$ | Benzoic acid | 121.5 | 16,690 | − 2.209 | 82.46 | 82.0 − 121.5 | 82.0° | (207, 209) |
| | B $C_9H_8O_2$ | Cinnamic acid | 136.8 | 19,050 | − 2.427 | 121.3 | 90.0 − 136.8 | 43.0 M % B | |
| 1401 | A $C_7H_6O_2$ | Benzoic acid | 121.0 | 24,020 | − 3.182 | 95.3 | 70.0 − 121.0 | 70.0° | (115, 345, 465) |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 37,710 | − 5.580 | 104.9 | 70.0 − 80.1 | 67.0 M % B | |
| 1407 | A $C_7H_6O_2$ | Benzoic acid | 121.4 | 21,630 | − 2.865 | 58.09 | 95.0 − 121.4 | 77.2° | (213) |
| | B $C_{14}H_{10}O_2$ | Benzil | 94.0 | 33,110 | − 4.714 | 172.2 | 77.2 − 94.0 | 59.3 M % B | |
| 1417 | A $C_7H_7Br$ | *o*-Bromotoluene | −27.0 | 11,480 | − 2.436 | 100 | − 37.3 − −27.0 | −37.3° | (172, 293) |
| | B $C_7H_7Br$ | *p*-Bromotoluene | 26.7 | 14,540 | − 2.534 | 100 | − 25.0 − 26.7 | 21.7 M % B | |
| 1422 | A $C_7H_7Cl$ | *o*-Chlorotoluene | −35.1 | 9,285 | − 2.038 | 100 | − 49.8 − −35.1 | −49.8° | (466, 474) |
| | B $C_7H_7Cl$ | *p*-Chlorotoluene | 7.8 | 12,665 | − 2.356 | 100 | − 35.0 − 7.8 | 27.0 M % B | |
| 1426 | A $C_7H_7ClO_2S$ | *o*-Toluenesulfone chloride | 10.1 | 13,210 | − 2.437 | 100 | 1.5 − 10.1 | 1.5° | (145, 179) |
| | B $C_7H_7ClO_2S$ | *p*-Toluenesulfone chloride | 67.2 | 21,350 | − 3.276 | 100 | 1.5 − 67.2 | 16.5 M % B | |
| 1439 | A $C_7H_7NO_2$ | *o*-Nitrotoluene | − 4.0 | 13,015 | − 2.526 | 100 | − 31.65− −4.0 | −31.65° | (32) |
| | B $C_7H_7NO_2$ | *m*-Nitrotoluene | 16.0 | 13,700 | − 2.476 | 100 | − 5.0 − 16.0 | 48.0 M % B | |
| 1440 | A $C_7H_7NO_2$ | *o*-Nitrotoluene | − 4.0 | 13,015 | − 2.526 | 100 | − 16.4 − −4.0 | −16.3° | (30, 127, 185) |
| | B $C_7H_7NO_2$ | *p*-Nitrotoluene | 51.4 | 15,440 | − 2.485 | 100 | 15.0 − 51.4 | 24.0 M % B‡ | |
| 1441 | A $C_7H_7NO_2$ | *m*-Nitrotoluene | 16.0 | 13,700 | − 2.476 | 100 | − 2.8 − 16.0 | −2.8° | (32, 127) |
| | B $C_7H_7NO_2$ | *p*-Nitrotoluene | 51.4 | 15,440 | − 2.485 | 100 | 15.0 − 51.4 | 33.0 M % B | |
| 1443 | A $C_7H_7NO_2$ | *p*-Nitrotoluene | 52.0 | 16,610 | − 2.669 | 107.0 | 35.0 − 52.0 | 29.0° | (222) |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 17,700 | − 2.618 | 93.44 | 40.0 − 80.1 | 36.5 M % B | |
| 1445 | A $C_7H_7NO_3$ | *p*-Nitroanisole | 52.6 | 16,660 | − 2.671 | 90.50 | 20.5 − 52.6 | 20.5° | (393, 394) |
| | B $C_{12}H_{11}N$ | Diphenylamine | 53.2 | 17,380 | − 2.781 | 110.5 | 20.5 − 53.2 | 49.0 M % B | |
| 1446 | A $C_7H_8$ | Toluene | | | | | | | (112, 345, 419 |
| | B $C_{10}H_8$ | Naphthalene | 80.1 | 19,850 | − 2.935 | 139.1 | 20.0 − 80.1 | | 436, 475) |
| 1448 | A $C_7H_8$ | Toluene | | | | | | | (345, 436) |
| | B $C_{12}H_{10}$ | Acenaphthene | 95.0 | 22,780 | − 3.233 | 167.4 | 10.0 − 95.0 | | |
| 1449 | A $C_7H_8$ | Toluene | | | | | | | (345) |
| | B $C_{13}H_{10}$ | Fluorene | 114.5 | 22,500 | − 3.031 | 180.5 | 10.0 − 114.5 | | |
| 1450 | A $C_7H_8$ | Toluene | | | | | | | (475) |
| | B $C_{14}H_8O_2$ | Anthraquinone | 285.2 | 28,720 | − 2.086 | 226.0 | 20.0 − 105 | | |
| 1451 | A $C_7H_8$ | Toluene | | | | | | | (475) |
| | B $C_{14}H_{10}$ | Anthracene | 216.5 | 27,290 | − 2.654 | 193.5 | 15.0 − 105.0 | | |
| 1452 | A $C_7H_8$ | Toluene | | | | | | | (153, 157, 475) |
| | B $C_{14}H_{10}$ | Phenanthrene | 99.0 | 19,340 | − 2.717 | 193.5 | 0.0 − 90.0 | | |
| 1471 | A $C_7H_9N$ | *o*-Toluidine | | | | | | | (345) |
| | B $C_7H_9N$ | *p*-Toluidine | 43.6 | 16,260 | − 2.682 | 100 | 0.0 − 43.6 | | |
| 1473 | A $C_7H_9N$ | *m*-Toluidine | | | | | | | (345) |
| | B $C_7H_9N$ | *p*-Toluidine | 43.6 | 16,260 | − 2.682 | 100 | 20.0 − 43.6 | | |

* 20.0 M % A at −1.8°.
† 51.6 M % B at 65.0°.
‡ 35.0 % B at 0.0°.

Equations.—(*Continued*)

| No. | | Formula | Name | M. P. | a | b | c | Range, °C | Eut. temp. and % | Lit. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1475 | A | $C_7H_9N$ | *p*-Toluidine | 43.5 | 22,400 | − 3.695 | 83.56 | 31.9 − 43.5 | 31.9° | (15, 345, 406) |
| | B | $C_{10}H_8$ | Naphthalene | 80.1 | 24,020 | − 3.275 | 119.6 | 40.0 − 80.1 | 27.5 M % B | |
| 1487 | A | $C_7H_9NO_2S$ | *o*-Toluenesulfonamide | 137.4 | 24,680 | − 3.140 | 100 | 110.5 − 137.4 | 110.5° | (94, 347) |
| | B | $C_7H_9NO_2S$ | *p*-Toluenesulfonamide | 156.3 | 27,580 | − 3.352 | 100 | 110.5 − 156.3 | 39.8 M % B | |
| 1490 | A | $C_8H_4Cl_2O_2$ | *sym*-Phthalyl chloride | 16.3 | 21,220 | − 3.828 | 100 | 8.0 − 16.3 | 8.0° | (84) |
| | B | $C_8H_4Cl_2O_2$ | *asym*-Phthalyl chloride | 88.5 | 16,460 | − 2.378 | 100 | 35.0 − 88.5 | 23.0 M % B | |
| 1492 | A | $C_8H_4O_3$ | Phthalic anhydride | 130.84 | 23,210 | − 3.002 | 115.6 | 64.9 − 130.84 | 64.9° | (341) |
| | B | $C_{10}H_8$ | Naphthalene | 80.05 | 19,310 | − 2.856 | 86.5 | 64.9 − 80.05 | 73.9 M % B | |
| 1504 | A | $C_8H_7N_3O_5$ | 2, 4-Dinitroacetanilide | 118.0 | 24,700 | − 3.299 | 125.0 | 110.0 − 118.0 | 110.0° | (184) |
| | B | $C_8H_8N_2O_3$ | *p*-Nitroacetanilide | 215.0 | 27,750 | − 2.050 | 80.0 | 110.0 − 215.0 | 15.0 M % B | |
| 1509 | A | $C_8H_8O_2$ | Phenylacetic acid | *ca.* 77.0 | 16,780 | − 2.504 | 90.65 | 50.0 − 77.0 | 21.5° | (407) |
| | B | $C_9H_{10}O_2$ | Hydrocinnamic acid | 47.5 | 14,950 | − 2.436 | 110.3 | 21.5 − 47.5 | 61.0 M % B | |
| 1516 | A | $C_8H_{10}$ | Xylene | | | | | | | (345) |
| | B | $C_{13}H_{10}$ | Fluorene | 114.5 | 22,500 | − 3.031 | 156.5 | 10.0 − 114.5 | | |
| 1524 | A | $C_8H_{10}N_4O_2$ | Caffeine | 233.5 | 24,700 | − 2.547 | 112.7 | 103.0 − 233.5 | 103.0° | (246) |
| | B | $C_{11}H_{12}N_2O$ | Antipyrine | 110.0 | 22,970 | − 3.133 | 88.72 | 103.0 − 110.0 | 37.0 M % B | |
| 1525 | A | $C_8H_{11}N$ | Dimethylaniline | 1.9 | 13,970 | − 2.652 | 66.36 | − 4.5 − 1.9 | −4.5° | (292) |
| | B | $C_{13}H_{12}O$ | Benzhydrol | 69.0 | 20,370 | − 3.110 | 150.7 | − 4.5 − 69.0 | 13.5 M % B | |
| 1526 | A | $C_8H_{11}N$ | Dimethylaniline | | | | | | | (292) |
| | B | $C_{17}H_{20}N_2O$ | Tetramethyldiaminobenzophenone | 174.0 | 29,000 | − 3.390 | 219.5 | 110 − 174 | * | |
| 1528 | A | $C_9H_8$ | Indene | | | | | | | (115, 345) |
| | B | $C_{10}H_8$ | Naphthalene | 80.1 | 19,810 | − 2.930 | 110.3 | 30.0 − 80.1 | | |
| 1529 | A | $C_9H_8$ | Indene | | | | | | | (345) |
| | B | $C_{12}H_{10}$ | Acenaphthene | 95.0 | 21,990 | − 3.121 | 132.8 | 30.0 − 95.0 | | |
| 1530 | A | $C_9H_8$ | Indene | | | | | | | (345) |
| | B | $C_{13}H_{10}$ | Fluorene | 114.5 | 20,980 | − 2.826 | 143.0 | 10.0 − 114.5 | | |
| 1549 | A | $C_{10}H_7NO_2$ | α-Nitronaphthalene | 57.0 | 16,550 | − 2.620 | 135.0 | 36.7 − 57.0 | 36.7° | (360, 369) |
| | B | $C_{10}H_8$ | Naphthalene | 80.0 | 18,950 | − 2.802 | 74.00 | 60.0 − 80.0 | 33.0 M % B† | |
| 1550 | A | $C_{10}H_7NO_2$ | α-Nitronaphthalene | 56.0 | 15,670 | − 2.488 | 121.0 | 16.1 − 56.0 | 16.1° | (455) |
| | B | $C_{10}H_9N$ | α-Naphthylamine | 48.2 | 14,540 | − 2.362 | 82.65 | 16.1 − 48.2 | 54.5 M % B | |
| 1551 | A | $C_{10}H_7NO_2$ | α-Nitronaphthalene | 58.0 | 16,550 | − 2.610 | 113.8 | 45.0 − 58.0 | 27.3° | (204) |
| | B | $C_{10}H_{16}O$ | Camphor | 179.0 | 4,691 | − 0.542 | 87.9 | 27.3 − 179.0 | 53.5 M % B | |
| 1553 | A | $C_{10}H_8$ | Naphthalene | 80.0 | 25,850 | − 3.824 | 88.88 | 61.0 − 80.0 | 61.0° | (82, 115, 467) |
| | B | $C_{10}H_8O$ | α-Naphthol | 93.5 | 27,660 | − 3.920 | 112.5 | 61.0 − 95.5 | 39.5 M % B | |
| 1560 | A | $C_{10}H_8$ | Naphthalene | 80.1 | 21,730 | − 3.212 | 94.1 | 7.5 − 80.1 | 7.5° | (282) |
| | B | $C_{10}H_{16}$ | Camphene | 49.3 | 2,948 | −0.4775 | 106.3 | 7.5 − 49.3 | 85.0 M % B | |
| 1561 | A | $C_{10}H_8$ | Naphthalene | 80.1 | 16,270 | − 2.408 | 84.3 | 32.3 − 80.1 | 32.3° | (100, 204) |
| | B | $C_{10}H_{16}O$ | Camphor | 179.0 | 4,863 | − 0.562 | 118.8 | 100.0 − 179.0 | 58.0 M % B | |
| 1563 | A | $C_{10}H_8$ | Naphthalene | 80.09 | 18,560 | − 2.743 | 83.1 | 39.4 − 80.09 | 39.4° | (467, 476) |
| | B | $C_{12}H_{10}$ | Diphenyl | 68.95 | 16,800 | − 2.567 | 120.3 | 39.4 − 68.95 | 56.0 M % B | |
| 1564 | A | $C_{10}H_8$ | Naphthalene | 80.1 | 17,610 | − 2.603 | 75.70 | 40.0 − 80.1 | 30.5° | (401, 467) |
| | B | $C_{12}H_{11}N$ | Diphenylamine | 52.5 | 16,840 | − 2.702 | 132.1 | 30.5 − 52.5 | 63.6 M % B | |
| 1566 | A | $C_{10}H_8$ | Naphthalene | 80.1 | 17,380 | − 2.570 | 77.09 | 55.0 − 80.1 | 55.0° | (345) |
| | B | $C_{13}H_{10}$ | Fluorene | 114.5 | 18,090 | − 2.438 | 129.7 | 55.0 − 114.5 | 36.5 M % B | |
| 1567 | A | $C_{10}H_8$ | Naphthalene | 80.1 | 17,820 | − 2.634 | 76.17 | 14.5 − 80.1 | 14.5° | (339) |
| | B | $C_{13}H_{12}$ | Diphenylmethane | 25.64 | 18,560 | − 3.248 | 131.3 | 14.5 − 25.64 | 75.0 M % B | |
| 1577 | A | $C_{10}H_8O$ | α-Naphthol | 95.5 | 22,780 | − 3.230 | 100 | 73.0 − 95.5 | 73.0° | (82, 467) |
| | B | $C_{10}H_8O$ | β-Naphthol | 122.2 | 22,100 | − 2.909 | 100 | 73.0 − 122.2 | 38.3 M % B | |
| 1583 | A | $C_{10}H_8O$ | α-Naphthol | 93.0 | | | | | 90.0° | (263) |
| | B | $C_{12}H_9N$ | Carbazole | 235.6 | 29,790 | − 3.059 | 116.0 | 90.0 − 235.6 | 7.0 Wt. % B | |
| 1595 | A | $C_{10}H_8O$ | β-Naphthol | 121.0 | | | | | 115.0° | (263) |
| | B | $C_{12}H_9N$ | Carbazole | 235.5 | 33,360 | − 3.430 | 116.0 | 135.0 − 235.5 | 9.0 Wt. % B | |
| 1601 | A | $C_{10}H_8O$ | β-Naphthol | 121.0 | | | | | 110.0° | (406, 467) |
| | B | $C_{14}H_{10}$ | Anthracene | 213.0 | 33,500 | − 3.610 | 123.6 | 110 − 213.0 | 13.0 Wt. % B | |
| 1625 | A | $C_{10}H_9N$ | β-Naphthylamine | 112.0 | 21,820 | − 2.960 | 94.04 | 90.0 − 112.0 | 55.0° | (204) |
| | B | $C_{10}H_{16}O$ | Camphor | 179.0 | 4,691 | − 0.542 | 106.3 | 80.0 − 179.0 | 64.0 M % B | |
| 1628 | A | $C_{10}H_9N$ | β-Naphthylamine | 111.0 | | | | | 98.0° | (406, 467) |
| | B | $C_{14}H_{10}$ | Anthracene | 213.0 | 29,960 | − 3.221 | 124.5 | 98.0 − 213.0 | 12.0 Wt. % B | |
| 1644 | A | $C_{10}H_{15}NO_2S$ | 1-Methyl-2-sulfoneamide-4-isopropylbenzene | 115.1 | 25,360 | − 3.412 | 100 | 96.5 − 115.1 | 96.5° | (384) |
| | B | $C_{10}H_{15}NO_2S$ | 1-Methyl-3-sulfoneamide-4-isopropylbenzene | 149.9 | 26,890 | − 3.321 | 100 | 96.5 − 149.9 | 33.2 M % B | |
| 1671 | A | $C_{12}H_9Br$ | Bromoacenaphthene | 51.2 | 31,590 | − 5.087 | 151.2 | 45.0 − 51.2 | 41.5° | (83) |
| | B | $C_{12}H_{10}$ | Acenaphthene | 92.5 | 20,000 | − 2.859 | 66.15 | 41.5 − 92.5 | 34.2 M % B | |
| 1672 | A | $C_{12}H_9Cl$ | Chloroacenaphthene | 69.8 | 16,710 | − 2.544 | 67.1 | 58.0 − 69.8 | 31.8° | (83) |
| | B | $C_{12}H_9I$ | Iodoacenaphthene | 62.0 | 14,205 | − 2.214 | 149.0 | 31.8 − 62.0 | 59.9 M % B‡ | |
| 1673 | A | $C_{12}H_9Cl$ | Chloroacenaphthene | 69.8 | | | | | 56.6° | (83) |
| | B | $C_{12}H_{10}$ | Acenaphthene | 92.5 | 19,890 | − 2.843 | 81.7 | 56.6 − 92.5 | 50.0 M % B§ | |
| 1674 | A | $C_{12}H_9I$ | Iodoacenaphthene | 62.0 | 13,400 | − 2.088 | 182.3 | 45.0 − 62.0 | 37.6° | (83) |
| | B | $C_{12}H_{10}$ | Acenaphthene | 92.5 | 14,205 | − 2.214 | 149.0 | 50.0 − 92.5 | 32.8 M % B | |
| 1678 | A | $C_{12}H_9N$ | Carbazole | 244.5 | 28,480 | − 2.873 | 73.25 | 204.5 − 244.5 | 204.5° | (370) |
| | B | $C_{18}H_{12}$ | Chrysene | 252.5 | 36,800 | − 3.655 | 136.5 | 204.5 − 252.5 | 51.0 Wt. % B | |
| 1680 | A | $C_{12}H_{10}$ | Acenaphthene | 95.0 | 20,870 | − 2.961 | 92.8 | 65.7 − 95.0 | 65.7° | (345) |
| | B | $C_{13}H_{10}$ | Fluorene | 113.5 | 18,560 | − 2.507 | 107.8 | 65.7 − 113.5 | 44.3 M % B | |
| 1686 | A | $C_{12}H_{10}N_2$ | Azobenzene | 68.0 | 25,880 | − 3.962 | 91.9 | 35.0 − 68.0 | 24.5° | (345, 372) |
| | B | $C_{12}H_{10}N_2O$ | Azoxybenzene | 35.0 | 19,530 | − 3.310 | 108.8 | 24.5 − 35.0 | 76.8 M % B | |
| 1687 | A | $C_{12}H_{10}N_2$ | Azobenzene | 68.5 | 24,310 | − 3.719 | 98.93 | 60.0 − 68.5 | 60.0° | (372, 475) |
| | B | $C_{12}H_{12}N_2$ | Hydrazobenzene | 131.0 | 23,620 | − 3.053 | 101.1 | 75.0 − 131.0 | 19.5 M % B | |

* 5.0 M % B at 30.0°, 7.5 M % B at 50°, 15.0 M % B at 80°.

† 52.0 M % B at 50.0°.

‡ 53.4 M % A at 40.0°.

§ 20.0 M % B at 63.0°.

Equations.—(*Continued*)

| No. | Formula | Name | M. P. | a | b | c | Range, °C | Eut. temp. and % | Lit. |
|---|---|---|---|---|---|---|---|---|---|
| 1695 | A $C_{12}H_{10}N_2$ | Azobenzene | 68.5 | | | | | 60.0° | (374) |
| | B $C_{14}H_{14}N_2$ | *p*-Azotoluene | 144.0 | 26,600 | − 3.333 | 115.4 | 75.0 − 144.0 | 13.2 M % B | |
| 1731 | A $C_{13}H_{10}O_3$ | Salol | 42.5 | 16,360 | − 2.709 | 81.05 | 32.5 − 42.5 | 32.5° | (335) |
| | B $C_{17}H_{12}O_3$ | Betol | 92.0 | 25,930 | − 3.712 | 123.4 | 32.5 − 92.0 | 19.0 M % B | |
| 1750 | A $C_{14}H_{10}$ | Anthracene | 216.5 | 34,180 | − 3.651 | 78.1 | 193.5 − 216.5 | 193.5° | (370) |
| | B $C_{18}H_{12}$ | Chrysene | 252.5 | 35,720 | − 3.552 | 128.2 | 193.5 − 252.5 | 40.0 Wt. % B | |
| 1757 | A $C_{14}H_{10}O_2$ | Benzil | 95.0 | 26,910 | − 3.802 | 99.06 | 86 − 95 | 86.0° | (37, 464) |
| | B $C_{14}H_{12}O_2$ | Benzoin | 134.0 | 41,000 | − 5.255 | 101.0 | 86 − 134 | 19.9 M % B | |
| 1799 | A $C_{16}H_{32}O_2$ | Palmitic acid | 60.3 | 48,250 | − 7.560 | 66.30 | 57.0 − 60.3 | 57.0° | (361) |
| | B $C_{27}H_{46}O$ | Cholesterol | 147.0 | 22,780 | − 2.832 | 150.9 | 57.0 − 147.0 | 16.7 M % B | |
| 1800 | A $C_{16}H_{32}O_2$ | Palmitic acid | 61.0 | 37,520 | − 5.870 | 31.74 | 54 − 61.0 | 54.0° | (246.5) |
| | B $C_{51}H_{98}O_6$ | Tripalmitin | 62.0 | 157,900 | −24.60 | 315.0 | 54 − 62.0 | 25.0 M % B | |
| 1827 | A $C_{18}H_{34}O_2$ | Oleic acid | 6.5 | | | | | 5.0° | (361) |
| | B $C_{27}H_{46}O$ | Cholesterol | 147.0 | 22,780 | − 2.832 | 136.9 | 60 − 147 | 15.0 M % B | |
| 1830 | A $C_{18}H_{36}O_2$ | Stearic acid | 68.5 | 59,750 | − 9.135 | 73.55 | 65 − 68.5 | 65.0° | (361) |
| | B $C_{27}H_{46}O$ | Cholesterol | 147.0 | 22,780 | − 2.832 | 136.0 | 65 − 147 | 20.5 M % B | |
| 1831 | A $C_{18}H_{36}O_2$ | Stearic acid | 67.5 | 48,260 | − 7.400 | 35.24 | 57 − 67.5 | 57.0° | (246.5) |
| | B $C_{51}H_{98}O_6$ | Tripalmitin | 62.0 | 164,600 | −25.65 | 283.8 | 57 − 62 | 42.0 M % B | |
| 1833 | A $C_{19}H_{16}$ | Triphenylmethane | 91.0 | 13,930 | − 1.998 | 93.9 | 78.5 − 91.0 | 78.5° | (251) |
| | B $C_{19}H_{16}O$ | Triphenyl carbinol | 160.0 | 28,850 | − 3.480 | 106.5 | 78.5 − 160.0 | 15.5 M % B | |

## LITERATURE

(For key to the periodicals see end of volume)


(1) Adriani, *7*, **33:** 453; 00. (2) Arctowski, *34*, **121:** 123; 95. (3) Arctowski, *93*, **11:** 272; 96. (4) Aten, *7*, **54:** 124; 05. (5) Atkins, *4*, **99:** 10; 11. (6) Austerweil, *34*, **178:** 1174; 24. (7) Bakunin and Agrisani, *36*, **45:** 197; 15. (8) Baskov, *53*, **45:** 1604; 13. (9) Baskov, *53*, **46:** 1699; 14.

(10) Baskov, *53*, **47:** 1533; 15. (11) Baskov, *53*, **50:** 589; 18. (12) Baskov, *183*, **9:** 155; 13. (13) Baskov, *183*, **12:** 126; 15. *10*, **4:** 214; 21. (14) Bassett and Simmons, *4*, **119:** 416; 21. (15) Battelli and Martinetti, *23*, **20:** 844; 85. (16) Baud, *6*, **27:** 89; 12. (17) Baud, *6*, **29:** 124; 13. (18) Baud, *34*, **154:** 351; 12. (19) Baud, *34*, **156:** 317; 13.

(20) Baud, *27*, **13:** 435; 13. (21) Baud and Gay, *34*, **150:** 1687; 10. (22) Baud and Gay, *27*, **9:** 114; 11. (23) Baume, *42*, **12:** 216; 14. (24) Baume and Borowski, *42*, **12:** 276; 14. (25) Baume and Germann, *42*, **12:** 242; 14. (26) Baume and Germann, *34*, **153:** 569; 11. (27) Baume and Pamfil, *34*, **155:** 426; 12. (28) Baume and Pamfil, *42*, **12:** 256; 14. (29) Beck, *7*, **48:** 641; 04. (29.5) Bell and Cordon, *45*, **13:** 307; 21.

(30) Bell, Cordon, Spry and White, *45*, **13:** 59; 21. (31) Bell and Herty, *45*, **11:** 1124; 19. (32) Bell and McEwen, *45*, **14:** 536; 22. (33) Bell and Sawyer, *45*, **11;** 1025; 19. (33.5) Bell and Spry, *45* **13:** 308; 21. (34) Bellucci, *22*, **21 II:** 610; 12. (35) Bellucci, *36*, **43 I:** 521; 13. (36) Bellucci and Grassi, *36*, **43 II:** 712; 13. (37) Benrath, *52*, **87:** 416; 13. (38) Bianchini, *22*, **23 I:** 608; 14. (39) Blanksma, *176*, **9:** 924; 12.

(40) Blanksma, *176*, **10:** 136; 13. (41) Blanksma, *176*, **11:** 26; 14. (42) Boeseken, *70*, **31:** 350; 12. (43) Bogoiavlenskii, *Trudy Voenna Chimiceskago Komiteta*, 1918: 101. *10*, **5:** 136; 25. (44) Bogoiavlenskii and Ssacharov, *195*, **15:** 197; 06. (45) Bogoiavlenskii and Vinogradov, *7*, **64:** 229; 08. (46) Bogoiavlenskii and Vinogradov, *195*, **15:** 230; 16. (47) Bogoiavlenskii, Bogolubov and Vinogradov, *185*, **78:** 1738; 07. (48) Bogoiavlenskii and Vinogradov, *185*, **78:** 1741; 07. (49) Borodovskii and Bogoiavlenskii, *53*, **36:** 559; 04.

(50) Bornwater and Holleman, *70*, **31:** 221; 12. (51) Bourgoin, *6*, **13:** 400; 78. (52) Bourgoin, *6*, **15:** 161; 78. (52.5) Main, *50*, **30:** 535; 26. (53) Bramley, *4*, **109:** 469; 16. (54) Bregman, *Thesis*, Lausanne, 1914. (55) Bruni, *36*, **28 II:** 508; 98. (56) Bruni and Berti, *36*, **30 II:** 76; 00. (57) Bruni and Berti, *22*, **9 I:** 393; 00. (58) Bruni and Finzi, *36*, **35 II:** 111; 05. (59) Bruni and Gorni, *22*, **8 II:** 181; 99.

(60) Bruni and Gorni, *22*, **9 II:** 326; 00. (61) Lobry de Bruyn, *70*, **9:** 184; 90. (62) Lobry de Bruyn, *Diss.*, Amsterdam, 1915. (63) Buguet, *34*, **149:** 857; 09. (64) Caille *34*, **148:** 1458; 09. (65) Comanducci, *73*, **4:** 311; 12. (66) Cambi, *22*, **21 I:** 773; 12. (67) Cameron, *50*, **2:** 409; 98. (68) Campetti, *23*, **52:** 114; 17. (69) Carlinfanti and Levi-Malvano, *36*, **39 II:** 353; 09.

(70) Carnelly and Thompson, *4*, **53:** 782; 88. (71) Carrick, *50*, **25:** 628; 21. (71.1) Carroll, Rollefson and Mathews, *1*, **47:** 1785; 25. (72) Centnerszwer, *7*, **29:** 715; 99. (73) Chapas, *34*, **172:** 538; 21. (74) Chattaway and Lambert, *4*, **107:** 1766; 15. (75) Chattaway and Lambert, *4*, **107:** 1773; 15. (76) Chavanne and Vos, *34*, **158:** 1582; 14. (76.5) Chipman, *1*, **46:** 2445; 24. (77) Christiansen, *147*, **4:** 3; 18. *10*, **5:** 935; 26. (78) Cohen, Meester and Moesveld, *70*, **42:** 779; 23. (79) Conant, Hartshorn and Richardson, *1*, **42:** 585; 20.

(80) Courtonne, *34*, **95:** 922; 82. (81) Crompton and Triffit, *4*, **119:** 1874; 21. (82) Crompton and Whitely, *4*, **67:** 327; 95. (83) Crompton and Walker, *4*, **101:** 958; 12. (84) Csanyi, *57*, **40:** 81; 19. (85) Ciusa and Bernardi, *56*, **40 II:** 158; 10. (86) Dahms, *8*, **54:** 486: 95. (87) Dahms, *8*, **60:** 119; 96. (88) Dahms, *6*, **18:** 140; 99. (89) Davies, *4*, **119:** 853; 21.

(90) Dawson and Mountford, *4*, **113:** 923; 18. (91) Dawson and Mountford, *4*, **113:** 923; 18. (92) Dehn, *1*, **39:** 1377; 17. (93) Dieckmann, *25*, **55:** 2470; 22. (94) Dobrianskii, *53*, **52:** 139; 20. (95) Dreyer and Rotarski, *7*, **54:** 353; 06. (95.5) Dubowitz, *Vegnesceti lapok*, **6:** 397. (96) Efremov, *169*, **18:** 391; 12. (97) Efremov, *169*, **18:** 169; 13. *10*, **4:** 214; 21. (98) Efremov, *53*, **45:** 348; 13. (99) Efremov, *169*, **23:** 629; 15.

(100) Efremov, *134*, **9:** 1309; 15. (101) Efremov, *134*, **10:** 21; 16. (102) Efremov, *53*, **48:** 1756; 16. *10*, **5:** 136; 25. (103) Efremov, *53*, **50:** 338; 18. (104) Efremov, *53*, **50:** 421; 18. (105) Efremov, *53*, **50:** 441; 18. (106) Efremov, *169*, **1:** 145; 19. *10*, **5:** 136; 25. (107) Efremov, *169*, **1:** 465; 19. *10*, **5:** 136; 25. (108) Efremov, *134*, **13:** 255; 19. (109) Efremov, *169*, **28:** 217; 19. *10*, **5:** 136; 25.

(110) Efremov, *53*, **51:** 353; 19. *10*, **5:** 136; 25. (111) English and Turner, *4*, **107:** 774; 15. (112) Étard, *6*, **2:** 503; 94. (113) Étard, *6*, **3:** 275; 94. (114) de Fazi, *36*, **46 I:** 334; 16. (115) Ferratini and Garelli, *36*, **22 II:** 245; 92. (116) Findlay and Hickmans, *4*, **91:** 905; 07. (117) Fokin, *53*, **44:** 163; 12. *10*, **3:** 91; 14. (118) Fox and Barker, *4*, **37:** 265; 18. (119) Frankland and Garner, *4*, **39:** 257; 20.

(120) Freundlich and Richards, *7*, **79:** 681; 12. (121) Freundlich and Posnjak, *7*, **79:** 168; 12. (122) Garelli, *36*, **24 II:** 263; 94. (123) Garelli and Calozlari, *36*, **29 II:** 258; 99. (124) Garelli and Ferratini, *36*, **23 I:** 442; 93. (125) de Gee, *Diss.*, Amsterdam, 1916. (126) Georgievics, *7*, **84:** 353; 13. (127) Gibson, Duckham and Fairbairn, *4*, **121:** 270; 22. (128) Giua, *25*, **47:** 1718; 14. (129) Giua, *36*, **45 I:** 339; 15.

(130) Giua, *36*, **45 I:** 557; 15. (131) Giua, *36*, **45 II:** 32; 15. (132) Giua, *36*, **45 II:** 348; 15. (133) Giua, *36*, **46 I:** 289; 16. (134) Giua, *36*, **46 I:** 272; 16. (135) Giua, *36*, **47 I:** 57, 17. (136) Giua, *36*, **47 I:** 74; 17. (137) Giua and Angeletti, *36*, **51 I:** 318; 21. (138) Giua and Cherchi, *36*, **49 II:** 264; 19. (139) Giua, Marcellino and Curti, *36*, **50 II:** 300; 20.

(140) Gomberg and Schoepfle, *1*, **41:** 1655; 19. (141) Tsakalotos and Guye, *43*, **8:** 340; 10. (142) Groschuff, *9*, **17:** 348; 11. (143) von Halban, *7*, **84:** 129; 13. (144) von Halban and Hecht, *9*, **24:** 65; 18. (145) Harding, *4*, **119:** 260; 21. (146) Hartley and Stuart, *4*, **105:** 309; 14. (147) Hartley and Thomas, *4*, **89:** 1013; 06. (148) Hartogs, *Thesis*, Amsterdam, 33; 1910. (149) Harvey and Back, *173*, **46:** 188; 21.

(150) Hasselblatt, *7*, **83:** 1; 13. (151) Hatcher and Skirrow, *1*, **39:** 1939; 17. (152) Heintz, *8*, **92:** 288; 54. (153) Henstock, *4*, **121:** 2124; 22. (154) Herz and Rathmann, *9*, **19:** 552; 13. (155) Herz and Rathmann, *9*, **19:** 887; 13. (156) Hetherington and Braham, *45*, **15:** 1060; 23. (157) Hildebrand, *1*, **39:** 2297; 17. (158) Hildebrand, Ellefson and Beebe, *1*, **39:** 2301: 17. (158.1) Hill and Mosbachev, *1*, **47:** 2544; 25. (159) Hoeflake, *70*, **40:** 488; 21.

(160) Holleman, *70*, **19:** 364; 00. (161) Holleman, *70*, **19:** 188; 00. (162) Holleman, *70*, **20:** 352; 01. (163) Holleman, *70*, **20:** 206; 01. (164) Holleman, *70*, **22:** 263; 03. (165) Holleman, *70*, **23:** 357; 04. (166) Holleman, *70*, **24:** 140; 05. (167) Holleman, *70*, **25:** 183; 06. (168) Holleman and Euwes, *70*, **27:** 153; 08. (169) Holleman, *70*, **27:** 458; 08.

(170) Holleman, *70*, **28:** 408; 09. (171) Holleman, *70*, **32:** 134; 13. (172) Holleman, *70*, **33:** 183; 14. (173) Holleman, Vermeulen and Mooy, *70*, **33:** 1; 14. (174) Holleman, *70*, **34:** 204; 15. (175) Holleman, *64V*, **17:** 569; 08. (176) Holleman and Antusch, *70*, **13:** 277; 94. (177) Holleman and van den Arends, *70*, **28:** 408; 09. (178) Holleman and de Bruijn, *70*, **19:** 79; 00. (179) Holleman and Caland, *25*, **44:** 2504; 11.

(180) Holleman, Hartogs and van der Linden, *25*, **44:** 704; 11. (181) Holleman and van der Linden, *70*, **30:** 304; 11. (182) Holleman and Pollak, *70*, **29:** 416; 10. (183) Holleman and Rinkes, *70*, **30:** 48; 11. (184) Holleman and Sluiter. *70*. **25:** 208; 06. (185) Holleman. Vermeulen and Mooy, *70*, **33:**

**1**; 14. (188) Hollmann, *7*, **43**: 129; 03. (187) Holm, *Diss.*, Amsterdam, 1921. (188) Hope and Riley, *4*, **123**: 2470; 23. (188.5) Hope and Riley, *4*, **121**: 2510; 22. (189) Isaac, *5*, **84**: 344; 10.

(190) Isaac, *5*, **88**: 205; 13. (191) van Iterson-Rotgans, *176*, **10**: 920; 13. (192) van Iterson-Rotgans, *7*, **87**: 305; 14. (193) Jaeger, *94*, **38**: 553; 04. (194) Jaeger, *94*, **40**: 113; 05. (195) Jaeger, *94*, **42**: 236; 06. (196) Jaeger, *64P*, **7**: 658; 05. (197) Jaeger, *64P*, **8**: 614; 06. (198) Jaeger, *64P*, **10**: 436; 08. (199) Jaeger, *70*, **26**: 311; 07.

(200) Jaeger, *Diss.*, Leiden, 1903. (201) Jaeger and van Kregten, *64P*, **14**: 729; 12. (202) Jaeger and van Kregten, *64V*, **20**: 700; 12. (203) James, Jones and Lewis, *4*, **117**: 1273; 20. (204) Jouniaux, *27*, **11**: 129; 12. (205, 206) Jouniaux, *27*, **11**: 546; 12. (207) Kachler, *27*, **13**: 460; 70. (207.5) Kanolt, U. S. Bur. Stands., *0*. (208) Kendall, *1*, **36**: 1222; 14. (209) Kendall, *1*, **36**: 1722; 14.

(210) Kendall, *1*, **38**: 1309; 16. (211) Kendall and Adler, *1*, **43**: 1470: 21. (212) Kendall and Booge, *1*, **38**: 1712; 16. (213) Kendall and Gibbons, *1*, **37**: 149; 15. (214) Kettner, *Diss.*, Amsterdam, 1919. (215) King and Orton, *4*, **99**: 1377; 11. (216) Klobbie, *7*, **14**: 615; 97. (217) de Koch, *7*, **48**: 129; 04. (218) Koopal, *70*, **34**: 115; 15. (219) Kremann, *75*, **113, II b**: 809; 04.

(220) Kremann, *75*, **113, II b**: 905; 04. (221) Kremann, *75*, **113, II b**: 1085; 04. (222) Kremann, *75*, **113, II b**: 864; 04. (223) Kremann, *75*, **114, II b**: 1201; 05. (224) Kremann, *75*, **115, II b**: 427; 06. (225) Kremann, *75*, **115, II b**: 1087; 06. (226) Kremann, *75*, **116, II b**: 1031; 07. (227) Kremann, *823*, **58**: 663; 08. (228) Kremann, *75*, **117, II b**: 569; 08. (229) Kremann, *75*, **119, II b**: 657; 10.

(230) Kremann, *75*, **120, II b**: 329; 11. (231) Kremann and Auer, *57*, **39**: 441; 18. (232) Kremann and Csanyi, *57*, **37**: 755; 16. (233) Kremann and Dietrich, *57*, **44**: 151; 23. (234) Kremann and Dietrich, *57*, **44**: 175; 23. (234.1) Kremann and Drazil, *57*, **45**: 345; 24. (235) Kremann and Fritsch, *57*, **41**: 631; 20. (236) Kremann, Geba and Moss, *75*, **119, II b**: 669; 10. (237) Kremann and Grasser, *57*, **37**: 723; 16. (238) Kremann and Haas, *57*, **40**: 155; 19. (239) Kremann and Haas, *57*, **40**: 189; 19.

(240) Kremann, Hemmelmayr and Riemer, *57*, **43**: 164; 22. (241) Kremann and Hofmeier, *75*, **119, II b**: 121; 10. (242) Kremann and Hohl, *57*, **41**: 613; 20. (243) Kremann, Hohl and Müller, *57*, **42**: 199; 21. (244) Kremann, Hönigstreg and Mauermann, *57*, **44**: 65; 23. (245) Kremann and Janetsky, *57*, **33**: 1055; 12. (246) Kremann and Janetzky, *57*, **44**: 49; 23. (246.5) Kremann and Klein, *57*, **34**: 1291; 13. (246.7) Kremann and Kropsch, *57*, **35**: 563, 823, 841; 14. (247) Kremann, Lupfer and Zodowsky, *57*, **41**: 499; 20. (248) Kremann and Marktl, *57*, **41**: 1; 20. (249) Kremann and Marktl, *57*, **41**: 43; 20.

(250) Kremann and Mauermann, *57*, **43**: 315; 22. (251) Kremann, Mauermann, Müller and Rösler, *57*, **43**: 321; 22. (252) Kremann and Müller, *57*, **42**: 181; 21. (253) Kremann and Odelga, *57*, **42**: 147; 21. (254) Kremann, Odelga and Zadowsky, *57*, **42**: 117; 21. (255) Kremann, Mauermann and Oswald, *57*, **43**: 335; 22. (256) Kremann and Petrischek, *57*, **38**: 385; 17. (257) Kremann and Petrischek, *57*, **38**: 405; 17. (258) Kremann and Pogantsch, *57*, **44**: 163: 23. (259) Kremann and Rodenis, *57*, **27**: 125; 06.

(260) Kremann and Schadinger, *57*, **39**: 833; 18. (261) Kremann and Schadinger, *57*, **40**: 35; 19. (261.5) Kremann and Schoulz, *57*, **33**: 1063; 12. (262) Kremann and Slovak, *57*, **41**: 5; 20. (263) Kremann and Slovak, *57*, **41**: 23; 20. (264) Kremann and Strohschneider, *57*, **39**: 505; 18. (265) Kremann and Strzelba, *57*, **42**: 167; 21. (266) Kremann, Sutter, Sitte, Strzelba and Dobotsky, *57*, **43**: 269; 22. (267) Kremann and Wenzing, *57*, **38**: 479; 17. (268) Kremann, Wischo and Paul, *57*, **36**: 911; 15. (269) Kremann and Wlk, *57*, **40**: 57; 19.

(270) Kremann and Wlk, *57*, **40**: 205; 19. (271) Kremann and Wlk, *57*, **40**: 237; 19. (272) Kremann and Zadowsky, *57*, **41**: 543; 20. (273) Kremann and Zechner, *57*, **39**: 777; 18. (274) Kremann and Zechner, *57*, **39**: 807; 18. (274.1) Kremann, Zechner and Drazil, *57*, **45**: 355; 24. (274.2.) Kremann, Zechner and Weber, *57*, **45**: 305; 24. (275) Jaeger and van Kregten, *64V*, **20**: 700; 12. (276) Kroeber, *7*, **93**: 641; 19. (277) Kruyt, *7*, **79**: 657; 12. (278) Kurilov, *7*, **23**: 547; 97. (279) Kurilov, *7*, **24**: 441; 97.

(280) Kurnakov and Efremov, *53*, **44**: 1992; 12. (281) Kurnakov and Efremov, *55*, **45**: 1295, 1992; 13. (282) Kurnakov and Efremov, *169*, **18**: 105; 12. (283) Kurnakov, Krotkov and Oksman, *53*, **47**: 558; 15. (284) Kurnakov and Kivjat, *169*, **20**: 664; 13. *10*, **4**: 214; 21. (285) Kurnakov and Kivjat, *53*, **46**: 1372; 14. *7*, **88**: 401; 14. (286) Kurnakov and Solovev, *53*, **48**: 1338; 16. (287) Küster, *7*, **5**: 601; 90. (288) Küster, *7*, **8**: 577; 91. (289) Küster and Würfel, *7*, **50**: 65; 04.

(290) Ladenburg and Sobecki, *25*, **43**: 2374; 10. (291) Lafortune, *28*, **32**: 314; 23. (292) Lang, *Diss.*, Zurich, 75; 12. (293) van der Laar, *70*, **26**: 1; 07. (294) Lautz, *7*, **84**: 611; 13. (295) Laws and Sidgwick, *4*, **99**: 2085; 11. (296) Lehmann, *136*, **38**: 388; 14. (297) Lehmann, *136*, **38**: 402; 14. (298) Lehmstedt, *245*, **13**: 118; 18. (299) Leopold, *7*, **66**: 359; 09.

(300) Lewis and Brighton, *1*, **40**: 482; 18. (301) Lidbury, *7*, **39**: 453; 02. (302) van der Linden, *25*, **45**: 231; 12. (303) van der Linden, *64V*, **20**: 218; 11. (304) Hartogs and van der Linden, *64V*, **19**: 1070; 11. (305) Linebarger, *1*, **15**: 45; 93. (306) Lloyd, *50*, **22**: 300; 18. (307) Maarse, *Diss.*, Amsterdam, 1913. (308) Maarse, *70*, **33**: 207; 14. (309) Macleod, Pfund and Kilpatrick, *1*, **44**: 2260; 22.

(310) Cohen and Moesveld, *7*, **93**: 385; 19. (311) Mameli, *172*, **10**: 157; 09. (312) Mameli and Cocconi, *36*, **52 II**: 113; 22. (313) Mameli and Cocconi, *36*, **53**: 149; 23. (314) Mameli and Mannessier, *Boll. della soc. medico-chirurgica, Pavia*, **1912**: 17. (315) Mameli and Mannessier, *36*, **43 II**: 586; 13. (316) Marden and Dover, *1*, **39**: 1; 17. (317) Mascarelli, *22*, **17 I**: 29; 08. (318) Mascarelli, *36*, **39 I**: 251; 09. (319) Mascarelli and Ascoli, *36*, **37 I**: 125; 07.

(320) Mascarelli and Babini, *36*, **41 I**: 89; 11. (321) Mascarelli and Constantino, *36*, **40 I**: 31; 10. (322) Mascarelli and Musatty, *36*, **41 I**: 103; 11. (323) Mascarelli and Pestalozza, *22*, **16 II**: 567; 07. (324) Mascarelli and Pestalozza, *22*, **17 I**: 601; 08. (325) Mascarelli and Pestalozza, *36*, **38 I**: 38; 08. (326) Mascarelli and Pestalozza, *36*, **39 I**: 218; 09. (327) Mascarelli and Sanna, *36*, **45 II**: 329; 15. (328) Mascarelli and Sanna, *22*, **24 II**: 91; 15. (329) Meldrum, *135*, **108**: 199; 13.

(330) Menschutkin, *53*, **45**: 1701; 13. (331) Menschutkin, *169*, **16**: 78; 12. (332) Meyer and Beer, *57*, **34**: 1195; 13. (333) Meyer, Brod and Soyka, *57*, **34**: 1113; 13. (334) Meyer, R. and Meyer, W., *25*, **52**: 1249; 19. (335) Miers and Isaac, *5*, **79**: 322; 07. (336) Miers and Isaac, *62*, **209 A**: 337; 08. (337) Miers and Isaac, *4*, **93**: 927; 08. (338) Mills, Parker and Prowse, *4*, **105**: 1537; 14. (339) Miolati, *7*, **9**: 649; 92.

(340) Mlodziejowski, *96*, **20**: 317; 23. (341) Monroe, *45*, **11**: 1116; 19. (341.5) Cohen and Moesveld, *7*, **93**: 385; 19. (342) Morrell and Hanson, *4*, **85**: 1520; 04. (343) Morgan and Challenor, *4*, **119**: 1537; 21. (344) Mortimer, *1*, **45**: 633; 23. (345) Mortimer, *0*. (346) Muchin, *9*, **18**: 757; 12. (347) McKie, *4*, **113**: 799; 18. (348) McKie, *4*, **119**: 777; 21. (349) Nagornov, *7*, **75**: 578; 11.

(350) Narbutt, *7*, **53**: 697; 05. (351) Nichols, *1*, **40**: 400; 18. (351.5) Nichols, *50*, **28**: 769; 24. (352) Noelting, *6*, **19**: 476; 10. (353) O'Connor, *4*, **119**: 400; 21. (353.1) O'Connor, *4*, **125**: 1422; 24. (354) Olivari, *73*, **3**: 90; 11. (354.5) Orton and Owen, *4*, **125**: 766; 24. (355) Owen, *4*, **123**: 3392; 23. (356) Padoa, *22*, **13 I**: 723; 04. (357) Padoa, *22*, **13 II**: 31; 04. (358) Padoa and Rotondi, *22*, **21 II**: 626; 12. (359) Page and Heasman, *4*, **123**: 3247; 23.

(360) Palazzo and Batelli, *23*, **19**: 514; 83. (361) Partington, *4*, **99**: 313; 11. (362) Pascal, *34*, **154**: 883; 12. (363) Pascal, *34*, **177**: 587; 23. (364) Pascal, *27*, **13**: 744; 13. (365) Pascal, *27*, **11**: 1030; 12. (366) Pascal, *27*, **11**: 321; 12. (367) Pascal, *27*, **11**: 595; 12. (368) Pascal, *27*, **15**: 451; 14. (369) Pascal, *27*, **24**: 388; 20.

(370) Pascal, *27*, **29**: 644; 21. (371) Pascal, *27*, **33**: 170; 23. (372) Pascal and Normand, *27*, **13**: 151; 13. (373) Pascal and Normand, *27*, **13**: 207; 13. (374) Pascal and Normand, *27*, **13**: 878; 13. (375) Paterno and Ampola, *36*, **27 I**: 481; 97. (376) Paterno and Mieli, *36*, **37 II**: 330; 07. (377) Paterno and Montemartini, *36*, **24 II**: 208; 94. (378) Paterno and Salimei, *36*, **43 II**: 245; 13. (379) Pavlevski, *180*, **6**: 379; 93. (379.5.) Pavlevski, *25*, **30**: 2805; 98.

(380) Petrie, *54*, **38**: 1327; 19. (381) Philip, *4*, **83**: 814; 03. (382) Philip, *4*, **103**: 284; 13. (383) Philip and Smith, *4*, **87**: 1735; 05. (384) Phillip, *1*, **46**: 686; 24. (385) Pickering, *4*, **63**: 998; 93. (386) Plotnikov, *53*, **47**: 1062; 15. (387) Plotnikov, *53*, **47**: 2060; 15. (388) Holleman and Polak, *70*, **29**: 416; 10. (389) Poma, *36*, **41 I**: 518; 11.

(390) Prins, *7*, **67**: 689; 09. (391) Pratolongo, *22*, **23 I**: 46; 14. (392) Pushin and Fioletova, *4*, **121**: 2822; 22. (393) Pushin and Grebenschikov, *53*, **45**: 741; 13. (394) Pushin and Grebenschikov, *183*, **8**: 165; 13. (395) Pushin and Mazarovich, *183*, **10**: 205; 14. *10*, **4**: 214; 21. (396) Pushin and Mazarovich, *53*, **46**: 1366; 14. (397) Reimer and Gatewood, *1*, **42**: 1475; 20. (398) McKie, *4*, **113**: 799; 18. (399) Rhodes and Hance, *50*, **25**: 491; 21.

(400) Robert, *27*, **25**: 463; 19. (401) Roloff, *7*, **17**: 325; 95. (402) von Romburgh, *64V*, **18**: 175; 09. (403, 404) Rothmund, *7*, **26**: 433; 98. (405) Rózsa, *9*, **17**: 934; 11. (406) Rudolfi, *7*, **66**: 705; 09. (407) Salkovski, *25*, **18**: 321; 85. (408) Sanderson and Jones, *54*, **39**: 8; 20. (409) Saposchnikov, Rdultovskii and Gelvich, *53*, **35**: 1072; 03.

(410, 411) Saposchnikov, *7*, **49**: 688; 04. (412) Saposchnikov and Rdultovskii, *53*, **35**: 1073; 03. (413) Scheuer, *7*, **72**: 513; 10. (414) Schmidlin and Lang, *25*, **43**: 2806; 10. (415) Schmidlin and Lang, *25*, **45**: 899; 12. (416) Schreinemakers, *7*, **25**: 543; 98. (417) Schreinemakers, *7*, **26**: 237; 98. (418) Schreinemakers, *7*, **29**: 577; 99. (419) Schroeder, *7*, **11**: 449; 93.

(420) Senden, *28*, **32**: 97; 23. (420.5) Laws and Sidgwick, *4*, **99**: 2085; 11. (421) Sidgwick, *4*, **107**: 672; 15. (422) Sidgwick and Allot, *4*, **123**: 2819; 23. (423) Sidgwick and Aldous, *4*, **119**: 1001; 21. (423.5) Sidgwick and Callow, *4*, **125**: 527; 24. (424) Sidgwick and Clayton, *4*, **121**: 2263; 22. (425) Sidgwick and Dash, *4*, **121**: 2586; 22. (426) Sidgwick and Ewbank, *4*, **119**: 979; 21. (426.1) Sidgwick and Neill, *4*, **123**: 2813; 23. (427) Sidgwick and Rubie, *4*, **119**: 1013; 21. (428) Sidgwick, Spurrell and Davies, *4*, **107**: 1202; 15. (429) Sidgwick and Turner, *4*, **121**: 2256; 22.

(430) Simpson and Jones, *54*, **38**: 325; 19. (431) Smith and Watts, *4*, **97**: 562; 10. (432) Smits, *64P*, **23**: 679; 21. (433) Smits and Berckmans, *64P* **21**: 401; 18. (434) Smits and Berckmans, *64V*, **27**: 163; 18. (435) Smits and de Leeuw, *87*, **19**: 283; 10. (436) Speyers, *12*, **14**: 293; 02. (437) Stobbe, *25*, **44**: 1481; 11. (438) Sudborough and Beard, *4*, **97**: 773; 10. (439) Sudborough and Beard, *4*, **99**: 209; 11.

(440) Sudborough and Lakhumalani, *4*, **111**: 41; 17. (441) Tausz and Schnabel, *136*, **43**: 726; 19. (442) Taylor and Rinkenbach, *1*, **45**: 44; 23. (443)

Taylor and Rinkenbach, *1*, **45**: 104; 23. (444) Taylor and Rinkenbach, *1*, **45**: 1218; 23. (444.1) Taylor and Rinkenbach, Bureau of Mines, Pittsburgh, Pa., *0*. (445) Taylor and Rinkenbach, *45*, **15**: 73; 23. (446) Taylor and Rinkenbach, *45*, **15**: 795; 23. (447) Taylor and Rinkenbach, *45*, **15**: 1070; 23. (447.1) Thiel and Schulte, *7*, **96**: 312; 20. (448) Chaumeil and Thomas, *34*, **176**: 1323; 23. (449) Roche and Thomas, *34*, **176**: 586; 23.

(450) Timmermans, *7*, **58**: 129; 07. (451) Timmermans, *Diss.*, Brussels, 1911. (452) Timofeev, *Diss.*, Kharkoff, 1894. (453) Tinkler, *4*, **103**: 2171; 13. (454) Fischer and Gröppel, *93*, **30**: 76; 17. (455) Tsakalotos, *27*, **11**: 284; 12. (456) Tsakalotos, *27*, **13**: 281; 13. (457) Tsakalotos, *49*, **12**: 355; 15 (458) Tsakalotos and Guye, *42*, **8**: 340; 10. (459) Turner and English, *4*, **105**: 1786; 14.

(460) Tyrer, *4*, **97**: 1778; 10. (461) Valeton, *64V*, **18**: 755; 10. (462) Vanstone, *4*, **95**: 590; 09. (463) Vanstone, *4*, **103**: 1826; 13. (464) Vanstone, *153*, **1913**: 426. (465) Vasiliev, *Diss.*, Kazani, 1917. (466) Vermeulen, *Diss.*, Amsterdam, 1914. (467) Vignon, *27*, **6**: 387; 656; 91. (468) Viala, *27*, **15**: 5; 14. (469) de Visser, *70*, **17**: 182; 98.

(470) Voano, *53*, **48**: 76; 16. (471) Wadsworth, *173*, **45**: 133; 20. (472) Waentig and Pescheck, *7*, **93**: 529; 19. (473) Wahl, *5*, **87**: 152; 12. (474) Wahl, Normand and Vermeylen, *34*, **174**: 946; 22. (475) Ward, *50*, **30**: 1316; 26. (476) Washburn and Read, *197*, **1**: 191; 15. (477) Weiss and Downs, *1*, **45**: 1003; 23. (478) Wheeler, *1*, **42**: 1842; 20. (479) Wibaut, *70*, **32**: 244; 13.

(480) Wibaut, *70*, **32**, 244; 13. (481) Wood and Scott, *4*, **97**: 1573; 10. (482) Wroczynski and Guye, *42*, **8**: 189; 10. (483) Yamanato, *44*, **25**: 123; 08. (484) Disselhamp, *7*, **123**: 99; 26.

## CRYOSCOPIC DATA, ORGANIC SOLVENTS

$k_F (= \Delta t/N)$ is the molal lowering for a normal solute in dilute solution in the solvent, as deduced from the freezing-point data. $N$ = moles of solute per 1000 grams of solvent.

The latent heat of fusion of the solvent in g-cal/g is given by $l = \frac{1.99 T_F^2}{1000 k_F}$, where $T_F$ is the freezing point of the pure solvent on the absolute scale.

### ℭ-Table

The ℭ-Arrangement

| Solvent | | $k_F$ | Lit. |
|---|---|---|---|
| Formula | Name | | |
| $CCl_4$ | Carbon tetrachloride | 29.80–34.8 | (14, 50) |
| $CS_2$ | Carbon disulfide | 3 83 | (14) |
| $CHBr_3$ | Bromoform | 14.25–14.435 | (1, 102); *cf.* (100) |
| $CHCl_3$ | Chloroform | 4.67–4.90 | (10, 14) |
| $CH_2I_2$ | Methylene iodide | 14.40 | (42) |
| | (Stable) | 14.40 | (9) |
| | (Metastable) | 13.70 | (9) |
| $CH_2N_2$ | Cyanamide | *ca.* 3.0 | (90) |
| $CH_2O_2$ | Formic acid | 2.770–2.80 | (92, 101, 106) |
| $CH_3NO$ | Formamide | 3.20–3.85 | (30, 105) |
| $C_2H_2Br_4$ | Tetrabromoacetylene | 21.70 | (57) |
| $C_2H_3Br_3O_2$ | Bromal hydrate | 11.04 | (13) |
| $C_2H_3ClO_2$ | Monochloroacetic acid | 5.211 | (59) |
| | (Stable) | 4.85 | (95) |
| | (Metastable) | 4.88 | (95) |
| | α-Monochloracetic acid | 5.241 | (60) |
| | β-Monochloracetic acid | 5.167 | (60) |
| $C_2H_4BrCl$ | Bromochloroethane | 8.63 | (50) |
| $C_2H_4Br_2$ | Ethylene dibromide (M. P., 9.975 dry) | 12.50–11.80 | (19, 61, 73, 92) |
| $C_2H_4O_2$ | Acetic acid | 3.90 | (15, 30, 61, 77, 92, 101) |
| $C_2H_5NO$ | Acetamide | 3.63 | (30) |
| $C_2H_5NO_2$ | Methyl carbamate | 4.49 | (36) |
| $C_2HCl_7$ | Heptachloropropane (*asym.*) | 12.0 | (16) |
| $C_3H_5N_3O_9$ | Nitroglycerine | 7.5 *ca.* | (54) |
| $C_3H_7NO$ | Acetoxime | 5.56 | (36) |
| $C_3H_7NO_2$ | Urethane | 5.00–5.14 | (30, 36, 101) |
| $C_4H_4N_2$ | Succinonitrile | 18.26 | (26) |
| $C_4H_4O_3$ | Succinic anhydride | 6.30 | (46) |
| $C_4H_6O_2$ | α-Crotonic acid | 6.50 | (46) |
| $C_4H_6O_4$ | Dimethyl oxalate | 5.00 | (7) |
| $C_4H_7Cl_3O_2$ | Chloral alcoholate | 8.06 | (36) |
| $C_4H_9NO_2$ | Methylurethane | 4.85 | (96) |
| $C_4H_{10}O$ | *tert.*-Butyl alcohol | 12.80 | (4) |

ℭ-Table.—(*Continued*)

| Solvent | | $k_F$ | Lit. |
|---|---|---|---|
| Formula | Name | | |
| $C_4H_{10}O$ | Ether | 1.79 | (14) |
| $C_5H_5N$ | Pyridine | 4.97 | (14) |
| $C_6Cl_6$ | Hexachlorobenzene | 20.75 | (62) |
| $C_6H_3Br_3O$ | 2, 4, 6-Tribromophenol | 20.40 | (28) |
| $C_6H_3Cl_3$ | 1, 3, 5-Trichlorobenzene | 8.70 | (28) |
| $C_6H_4BrCl$ | *p*-Bromochlorobenzene | 9.20–9.99 | (6, 24, 48) |
| $C_6H_4BrNO_2$ | *o*-Bromonitrobenzene | 9.10 | (52) |
| | *m*-Bromonitrobenzene | 8.75 | (52) |
| | *p*-Bromonitrobenzene | 11.53 | (52) |
| $C_6H_4Br_2$ | *p*-Dibromobenzene | 11 57–12.40 | (6, 8, 24, 29) |
| $C_6H_4ClNO_2$ | *o*-Chloronitrobenzene | 7.50 | (52) |
| | *m*-Chloronitrobenzene | 6.07 | (52) |
| | *p*-Chloronitrobenzene | 10.80–10.90 | (6, 30) |
| $C_6H_4Cl_2$ | *p*-Dichlorobenzene | 7.22–7.70 | (6, 8, 24, 29, 48, 50) |
| $C_6H_4N_2O_4$ | *m*-Dinitrobenzene | 10.60 | (6) |
| $C_6H_5BrO$ | *p*-Bromophenol | 10.8 | (36) |
| $C_6H_5ClO$ | *o*-Chlorophenol | 7.72 | (52) |
| | *m*-Chlorophenol | 8.30 | (52) |
| | *p*-Chlorophenol | 8.58 | (52) |
| $C_6H_5NO_2$ | Nitrobenzene (M. P., 5.67) | 6.89–7.10 | (6, 17, 29, 48, 50, 92, 93) |
| | (M. P. 5.82) | 8.10 | (12) |
| $C_6H_5NO_3$ | *o*-Nitrophenol | 7.5 | (97) |
| | *m*-Nitrophenol | 7.80 | (97) |
| | *p*-Nitrophenol | 8.60 | (97) |
| $C_6H_6$ | Benzene | 4.90–5.23 | (8, 31, 38, 46, 50, 51, 61, 66, 71, 79, 84, 85, 88, 92, 98, 99, 100, 104) |
| $C_6H_6Cl_6$ | α-*trans*-Benzene hexachloride | 16.50 | (62) |
| $C_6H_6O$ | Phenol | 7.20–7.50 | (30, 35, 36, 46, 101, 103) |
| $C_6H_6O_2$ | *o*-Dihydroxybenzene | 7.13 | (52) |
| $C_6H_6O_2$ | Resorcinol | 6.50 | (41) |
| $C_6H_7N$ | Aniline | 5.87 | (2) |
| $C_6H_8N_2$ | Phenylhydrazine | 5.859 | (74) |
| $C_6H_{10}O_4$ | Dimethyl succinate | 5.55 | (19, 23, 28) |
| $C_6H_{12}$ | Cyclohexane | 20.00–20.30 | (50, 63, 65, 66) |
| $C_6H_{12}O$ | Cyclohexanol | 3.828 | (39); *cf.* (96.5) |
| $C_6H_{12}O_3$ | Paraldehyde | 7.05 | (58) |
| $C_7H_5NO_3$ | *p*-Nitrobenzaldehyde | 7.0 *ca.* | (25) |
| $C_7H_5N_3O_6$ | 2, 4, 6-Trinitrotoluene | 11.50 | (6) |
| $C_7H_6N_2O_4$ | 2, 4-Dinitrotoluene | 8.90 | (6) |
| $C_7H_6O_2$ | Benzoic acid | 7.85–8.788 | (46, 72) |
| $C_7H_7Br$ | *p*-Bromotoluene | 8.20–8.55 | (8, 29, 48, 50, 82) |
| $C_7H_7Cl$ | *p*-Chlorotoluene | 5.60 | (8) |
| $C_7H_7I$ | *p*-Iodotoluene | 10.0–11.30 | (8, 29) |
| $C_7H_7NO$ | Benzamide | 9.65 | (62) |
| $C_7H_7NO_2$ | *o*-Nitrotoluene (stable) | 7.18 | (78) |
| | (Metastable) | 5.08 | (78) |
| | *m*-Nitrotoluene | 6.78–6.84 | (52, 96) |
| | *p*-Nitrotoluene | 7.80 | (6, 8) |
| $C_7H_8O$ | *o*-Cresol | 5.62 | (34) |
| | *p*-Cresol | 7.55 | (36) |
| $C_7H_8O_2$ | 2, 6-Dimethylpyrone | 6.46 | (89) |
| $C_7H_9N$ | *p*-Toluidine | 5.10–5.37 | (8, 28, 35, 36, 101) |
| $C_8H_6N_2$ | Quinoxaline | 8.90 | (79) |
| $C_8H_7BrO_2$ | Methyl *p*-bromobenzoate | 8.40 | (29) |
| $C_8H_8O$ | Acetophenone | 5.65 | (46) |
| $C_8H_8O_2$ | Phenylacetic acid | 9.00 | (25) |
| $C_8H_9NO$ | Acetanilide | 6.932 | (72) |
| $C_8H_{10}$ | *p*-Xylene | 4.30 | (8, 41, 66, 79, 87) |
| $C_8H_{10}O_2$ | *o*-Dimethoxybenzene | 6.38–6.40 | (19, 83) |
| $C_8H_{11}N$ | Dimethylaniline | 5.80 | (3) |
| $C_9H_8O_2$ | Cinnamic acid | *ca.* 9.4–10.00 | (37, 72) |
| $C_9H_9NO_4$ | Ethyl *o*-nitrobenzoate | 7.40 | (22) |
| $C_9H_{10}N_2O_3$ | *m*-Nitro-*p*-acettoluide (stable) | 8.7 | (95) |
| | (Metastable) | 9.905 | (95) |
| $C_9H_{10}O_2$ | Methyl *p*-toluate | 6.20 | (8) |
| $C_9H_{10}O_2$ | Phenylpropionic acid | 8.87–8.95 | (23, 36) |

**C-Table.**—(*Continued*)

| Solvent | | $k_F$ | Lit. |
|---|---|---|---|
| Formula | Name | | |
| $C_{10}H_7Br$ | β-Bromonaphthalene | 12.40 | (29) |
| $C_{10}H_7Cl$ | β-Chloronaphthalene | 9.76 | (29) |
| $C_{10}H_7I$ | β-Iodonaphthalene | 15.00 | (29) |
| $C_{10}H_7NO_2$ | α-Nitronaphthalene | 9.10 | (29) |
| $C_{10}H_8$ | Naphthalene | 6.899–7.10 | (5, 6, 7, 34, 35, 47, 48, 50, 72, 79, 103) |
| $C_{10}H_8O$ | β-Naphthol | 11.25 | (18) |
| $C_{10}H_9N$ | α-Naphthylamine | 7.80–7.90 | (28, 35) |
| $C_{10}H_{10}O_2$ | Methyl cinnamate | 7.10 | (27) |
| $C_{10}H_{10}O_3$ | Ethyl *o*-aldehydobenzoate | 6.05 | (27) |
| $C_{10}H_{12}O$ | *p*-Anethole | 6.12–6.22 | (36, 46) |
| $C_{10}H_{14}O$ | Thymol | 8.30–8.32 | (36, 43) |
| $C_{10}H_{15}BrO$ | *d*-Bromocamphor | 11.87 | (81) |
| $C_{10}H_{16}O$ | Camphor | 49.80 | (55, 56) |
| $C_{10}H_{16}O$ | Fenchone | 6.81 | (53) |
| $C_{10}H_{18}O$ | Cineole | 6.70 | (38) |
| $C_{10}H_{20}O$ | Menthol | 12.40 | (43) |
| $C_{10}H_{20}O_2$ | Capric acid | 4.73 | (36) |
| $C_{12}H_9N$ | Carbazole | 12.30 | (40) |
| $C_{12}H_{10}$ | Diphenyl | 8.00–8.35 | (36, 46, 79) |
| $C_{12}H_{10}N_2$ | Azobenzene | 8.25–8.35 | (32, 36) |
| $C_{12}H_{10}N_2O$ | Azoxybenzene | 8.50 | (27) |
| $C_{12}H_{10}O$ | Diphenyl ether | 8.00 | (33) |
| $C_{12}H_{11}N$ | Diphenylamine | 8.40–8.80 | (25, 35, 101) |
| $C_{12}H_{14}O_4$ | Isoapiol | 8.00 | (46) |
| $C_{12}H_{13}N_4O$ | Phenylhydrazine hydrate | 4.415 | (75) |
| $C_{12}H_{18}O_8$ | Diethyl diacetyl-*d*-tartrate | 13.32 | (85, 86) |
| $C_{12}H_{22}$ | Dicyclohexyl | 14.52 | (70) |
| $C_{12}H_{24}O_2$ | Lauric acid | 4.40 | (35) |
| $C_{13}H_{10}O$ | Benzophenone | 9.88 | (36) |
| $C_{13}H_{10}O_2$ | Phenyl benzoate | 8.00 | (45) |
| $C_{13}H_{10}O_3$ | Salol | 12.30 | (45) |
| $C_{13}H_{12}$ | Diphenylmethane | 6.60–6.72 | (25, 36, 64) |
| $C_{13}H_{12}N_2$ | Benzaldehyde phenylhydrazone | 11.30 | (80) |
| $C_{13}H_{13}N$ | Benzylaniline | 8.70 | (43) |
| $C_{13}H_{17}NO$ | Cyclohexyl aminobenzoate | 14.20 | (62) |
| $C_{14}H_8O_2$ | Anthraquinone | 14.80 | (11) |
| $C_{14}H_{10}$ | Anthracene | 11.65 | (40) |
| $C_{14}H_{10}$ | Phenanthrene | 12.00 | (44, 46, 79) |
| $C_{14}H_{10}O_2$ | Benzil | 10.50 | (6, 64) |
| $C_{14}H_{12}$ | Stilbene | 8.38 | (24) |
| $C_{14}H_{14}$ | Dibenzyl | 7.20–7.23 | (43, 64) |
| $C_{14}H_{14}N_2O_2$ | *p, p'*-Azoxyanisole | 7.64 | (7) |
| $C_{16}H_{32}O_2$ | Palmitic acid | 4.40 | (35) |
| $C_{16}H_{34}O$ | Cetyl alcohol | 6.15 | (36) |
| $C_{18}H_{34}O_2$ | Elaidic acid | 3.90 | (23) |
| $C_{18}H_{36}O_2$ | Stearic acid | 4.40–4.50 | (36, 46) |
| $C_{19}H_{16}$ | Triphenylmethane | 12.45 | (43) |
| $C_{22}H_{42}O_2$ | Brassidic acid | 4.16 | (68) |
| $C_{22}H_{42}O_2$ | Erucic acid | 5.23 | (68) |
| $C_{22}H_{42}O_2$ | Isoerucic acid | 5.25 | (68) |
| $C_{22}H_{44}O_2$ | Behenic acid | 4.44 | (67.5) |
| $C_{57}H_{110}O_6$ | Stearin | 5.15 | (36) |

*See further* p. 215.

## LITERATURE

(For a key to the periodicals see end of volume)


(1) Ampola and Manuelli, *36*, **25 II**: 91; 95. (2) Ampola and Rimatori, *36*, **27 I**: 35; 97. (3) Ampola and Rimatori, *36*, **27 I**: 51; 97. (4) Atkins, *4*, **99**: 10; 11. (5) Auwers, *7*, **18**: 595; 95. (6) Auwers, *7*, **30**: 300; 99. (7) Auwers, *7*, **32**: 39; 00. (8) Auwers, *7*, **42**: 513; 02. (9) Beckmann, *7*, **46**: 853; 03.

(10) Beckmann and Faust, *7*, **89**: 247; 14. (11) Beckmann and Hanslian, *93*, **80**: 221; 13. (12) Beckmann and Lockeman, *7*, **60**: 385; 07. (13) Beckmann and Maxim, *25*, **47**: 2875; 14. (14) Beckmann and Waentig, *93*, **67**: 17; 10. (15) Berlandi, *27*, **33**: 466; 23. (16) Boeseken and Benedictus, *70*, **37**: 121; 18. (17) Boeseken and van der Eerden, *70*, **33**: 300; 14. (18) Bruni, *36*, **28 II**: 322; 98. (19) Bruni and Amadori, *83*, **5**: 290; 10.

(20) Bruni and Amadori, *36*, **42 I**: 121; 12. (21) Bruni and Callegari, *22*, **13 I**: 481; 04. (22) Bruni and Callegari, *22*, **13 I**: 567; 04. (23) Bruni and Gorni, *36*, **30 I**: 55; 00. (24) Bruni and Gorni, *36*, **30 II**: 127; 00. (25) Bruni and Gorni, *36*, **31 I**: 48; 01. (26) Bruni and Manuelli, *9*, **11**: 860; 05. (27) Bruni and Mascarelli, *36*, **33 I**: 89; 03. (28) Bruni and Padoa, *36*, **33 I**: 78; 03. (29) Bruni and Padoa, *36*, **34 I**: 133; 04.

(30) Bruni and Trovanelli, *36*, **34 II**: 349; 04. (31) Challenger and Goddard, *4*, **117**: 762; 20. (32) Ciusa, *36*, **51 I**: 49; 21. (33) Durand and Rouge, *27*, **37**: 697; 25. (34) Eykman, *7*, **3**: 113; 89. (35) Eykman, *7*, **3**: 203; 89. (36) Eykman, *7*, **4**: 497; 89. (37) Falciola, *36*, **52 I**: 175; 22. (38) Fawsitt, *4*, **115**: 790; 19. (39) de Forcrand, *34*, **154**: 1767; 12.

(40) Garelli, *36*, **24 II**: 263; 94. (41) Garelli, *36*, **25 II**: 173; 95. (42) Garelli and Bassani, *36*, **31 I**: 407; 01. (43) Garelli and Calsolari, *36*, **29 II**: 258; 99. (44) Garelli and Ferratini, *36*, **23 I**: 442; 93. (45) Garelli and Gorni, *36*, **34 II**: 101; 04. (46) Garelli and Montanari, *36*, **24 II**: 229; 94. (47) Gomberg and Schoepfle, *1*, **39**: 1652; 17. (48) Gomberg and Schoepfle, *1*, **41**: 1655; 19.

(50) Gomberg and Sullivan, *1*, **44**: 1810; 22. (51) Guinchant, *6*, **10**: 30; 18. (52) Jona, *36*, **39 II**: 289; 09. (53) Jona, *36*, **47 II**: 87; 17. (54) Jones, *4*, **115**: 76; 19. (55) Jouniaux, *34*, **154**: 1592; 12. (56) Jouniaux, *27*, **11**: 722, 993; 12. (57) Lespieau, *34*, **169**: 31; 19. (58) Louguinine and Dupont, *27*, **11**: 904; 12. (59) Mameli, *36*, **39 II**: 579; 09.

(60) Mameli and Mannesier, *36*, **42 II**: 566; 12. (61) Mascarelli, *36*, **47 I**: 160; 17. (62) Mascarelli and Babini, *36*, **41 I**: 89; 11. (63) Mascarelli and Benati, *36*, **37 II**: 527; 07. (64) Mascarelli and Musatti, *22*, **19 I**: 213; 10. (65) Mascarelli and Musatti, *36*, **41 I**: 73; 11. (66) Mascarelli and Musatti, *36*, **41 I**: 82; 11. (67) Mascarelli and Musatti, *36*, **41 I**: 103; 11. (67.5) Mascarelli and Toschi, *36*, **45 I**: 313; 15. (68) Mascarelli and Sanna, *36*, **45 II**: 208; 15. (69) Mascarelli and Sanna, *36*, **45 II**: 335; 15.

(70) Mascarelli and Vecchiotti, *36*, **42 I**: 106; 12. (71) Mathews, *1*, **33**: 1291; 11. (72) Mathews, *1*, **39**: 1125; 17. (73) Moles, *7*, **80**: 531; 12. (74) Oddo, *36*, **43 II**: 263; 13. (75) Oddo, *36*, **43 II**: 274; 13. (76) Oddo, *36*, **45 I**: 283; 15. (77) Oliveri-Mandala, *36*, **50 I**: 256; 20. (78) Ostromuislenskii, *7*, **57**: 341; 06. (79) Padoa, *36*, **34 I**: 146; 04.

(80) Padoa, *36*, **41 I**: 203; 11. (81) Padoa and Rotondi, *22*, **21 II**: 626; 12. (82) Paterno, *36*, **26 II**: 1; 96. (83) Paterno, *36*, **26 II**: 9; 96. (84) Paterno, *36*, **19**: 640; 89. (85) Paterno and Manuelli, *22*, **6 I**: 401; 97. (86) Paterno and Manuelli, *36*, **49 II**: 365; 19. (87) Paterno and Montemartini, *36*, **24 II**: 197; 94. (88) Peddle and Turner, *4*, **99**: 685; 11. (89) Poma, *36*, **41 II**: 518; 11.

(90) Pratolongo, *22*, **22 II**: 716; 13. (91) Pushin and Glagoleva, *53*, **47**: 100; 15. (92) Raoult, *6*, **2**: 66; 84. (93) Roberts and Bury, *4*, **123**: 2037; 23. (94) Sachanov, *53*, **48**: 361; 16. *10*, **4**: 713; 22. (95) Schenck, *7*, **33**: 445; 00. (96) Scheuer, *7*, **72**: 513; 10. (96.5) Schreiner and Frivold, *7*, **124**: 1; 26. (97) Sidgwick, Spurrel and Davies, *4*, **107**: 1202; 15. (98) Swartz, *27*, **25**: 145; 19. (99) Turner, *4*, **99**: 880; 11.

(100) Turner and English, *4*, **105**: 1786; 14. (101) Turner and Pollard, *4*, **105**: 1751; 14. (102) Walden, *93*, **68**: 307; 10. (103) Weitz, Roth and Nelken, *13*, **425**: 161; 21. (104) Willcox and Brunel, *1*, **38**: 2533; 16. (105) Winther, *7*, **60**: 563; 07. (106) Zanninovich-Tessarin, *36*, **26 I**: 311; 96.

# FREEZING-POINT—SOLUBILITY DATA FOR NON-AQUEOUS SYSTEMS, CONTAINING BOTH ORGANIC AND INORGANIC COMPOUNDS

ROBERT KREMANN

### Scope

This section covers all non-aqueous two-component systems composed of (1) a chemical compound whose key-formula does not begin with 16 (called the A-component) together with (2) a chemical compound whose key-formula begins with 16 (called the B-component); and all non-aqueous three-component systems containing one but only one chemical compound whose key-formula begins with 16.

### Arrangement

To find a given system: Look first in Part I and, if not found there, consult Part II. For cryoscopic data consult Part IV.

**Part I** (p. 186)

Part I includes two-component systems for which data are available over a considerable range of temperature and compositions. The systems are arranged in order of their A-components using the standard arrangement (*v.* Vol. III, p. viii). Under each A-component the B-components are in order of increasing number of carbon atoms (the ℭ-arrangement).

**Part II** (p. 205)

The data in Part II are largely fragmentary in nature, consisting of solubilities of one constituent at one or at a few temperatures only. The arrangement is first by "solvents" in ascending order of number of carbon atoms. The "solutes" under each solvent are in the standard arrangement (*v.* Vol. III, p. viii).

**Part III** (p. 211)

Three-component systems. Standard arrangement.

**Part IV** (p. 214)

Cryoscopic data.

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### Übersicht

Dieser Abschnitt enthält alle nicht wässrige Zweikomponenten Systeme die zusammengesetzt sind (1) aus einer chemischen Verbindung deren Schlüsselformel nicht mit 16 beginnt (genannt A-Komponente) und (2) zusammen mit einer chemischen Verbindung deren Schlüsselformel mit 16 beginnt (genannt B-Komponente). Es sind hier ferner alle nicht wässrige Dreikomponenten Systeme enthalten die eine und zwar nur eine chemische Verbindung enthalten, deren Schlüsselformel mit 16 beginnt.

### Anordnung

Um ein gegebenes System zu finden sehe man zuerst im Teil I nach. Liegt es hier nicht vor, so schlage man Teil II auf. Für kryoskopische Daten verwende man Teil IV.

**Teil I** (S. 186)

Teil I enthält das Zweikomponentensystem für welches über ein beträchtliches Temperatur und Zusammensetzungsgebiet Daten vorliegen. Diese Systeme sind nach ihren A-Komponenten mit Benützung der Standardanordnung (Bd. III, S. viii) gereiht. Unter jeder A-Komponente folgen die B-Komponenten mit zunehmender Zahl der Kohlenstoffatome, (ℭ-Anordnung).

**Teil II** (S. 205)

Die Werte in diesem Teil sind meistens ihrer Natur nach unvollständig und enthalten die Löslichkeit nur des einen Bestandteiles bei einer Temperatur oder nur bei wenigen Temperaturen. Die Anordnung folgt zuerst dem "Lösungsmittel" nach steigender Zahl der Kohlenstoffatome. Die "gelösten Stoffe" bei jedem Lösungsmittel folgen nach der Standardanordnung (Bd. III, S. viii).

**Teil III** (S. 211)

Dreikomponenten Systeme. Standardanordnung.

**Teil IV** (S. 214)

Kryoskopische Daten.

### Champ de la section

Cette section comprend tous les systèmes non aqueux à deux constituants composés (1) d'un composé chimique dont la formule clé ne commence pas par 16 (appelé le constituant A) avec (2) un composé chimique dont la formule clé commence par 16 (appelé le constituant B); et tous les systèmes non aqueux à trois constituants contenant seulement un composé chimique dont la formule clé commence par 16.

### Arrangement

Pour trouver un système donné; voir d'abord à la Partie I et si on ne le trouve pas à cette place consulter la Partie II. Pour les données cryoscopiques consulter la Partie IV.

**Partie I** (p. 186)

La Partie I comprend les systèmes à deux constituants pour lesquels les données sont disponibles dans un intervalle considérable de température et de compositions. Les systèmes sont arrangés dans l'ordre de leurs constituants A suivant l'arrangement type (*v.* Vol. III, p. viii). Sous chaque constituant A, les constituants B sont disposés dans l'ordre croissant du nombre d'atomes de carbone (Arrangement ℭ).

**Partie II** (p. 205)

Les données dans la Partie II sont pour la plupart fragmentaires et consistent en solubilités d'un constituant à une ou à quelques températures seulement. L'arrangement est d'abord fait suivant les "dissolvants" disposés dans l'ordre ascendant du nombre d'atomes de carbone. Les "corps dissous" dans chaque solvant sont disposés suivant l'arrangement type (*v.* Vol. III, p. viii).

**Partie III** (p. 211)

Systèmes à trois constituants. Arrangement type.

**Partie IV** (p. 214)

Données cryoscopiques.

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### Sommario

Sono contenuti in questo capitolo tutti i sistemi non acquosi a due componenti costituiti da un composto con formula chiave che non comincia con 16 (Componente A) e da un composto con formula chiave che comincia con 16 (Componente B). Vi sono inclusi inoltre tutti i sistemi non acquosi a tre componenti, uno dei quali ha formula chiave che comincia con 16.

### Ordine di disposizione

Per trovare un dato sistema si consulti prima la Parte I, e, se non si trova in questa, si consulti la Parte II. Per i dati crioscopici si consulti la Parte IV.

**Parte I** (p. 186)

Questa comprende i sistemi a due componenti per i quali si hanno dati che si referiscono ad un largo intervallo di temperatura e di composizione. I sistemi sono elencati nell'ordine dei componenti A secondo la maniera standard di disposizione (*v.* Vol. III, p. viii). Sotto ciascun componente A sono disposti i componenti B ordinati secondo il numero crescente degli atomi di carbonio (disposizione ℭ).

**Parte II** (p. 205)

I dati di questa seconda parte sono molto frammentari e si riferiscono alla solubilità di un componente a una sola temperatura o a poche temperature. Nell'elenco "i solventi" sono disposti nell'ordine crescente del numero di atomi di carbonio. Le sostanze disciolte sono segnate sotto ciascun solvente secondo l'ordine standard di disposizione (*v.* Vol. III, p. viii).

**Parte III** (p. 211)

Sistemi a tre componenti. Ordine standard di disposizione.

**Parte IV** (p. 214)

Dati criosopici.

## TWO-COMPONENT SYSTEMS

Part I

For abbreviations, *v.* p. 4

### $H_2O_2$

B = $C_{12}H_{22}O_{11}$
Sucrose (68)

| °C | Mol % B |
|---|---|
| | B |
| − 1.70 | 0.0 |
| − 1.97 | 0.40 |
| − 2.60 | 1.24 |
| − 3.47 | 2.23 |
| − 4.72 | 3.23 |
| − 5.70 | 4.26 |
| − 7.57 | 5.46 |
| −10.30 | 6.94 |
| −14.32 | 9.04 |

### HCl

B = $CH_3Cl$ (6)

| °C | Mol % B |
|---|---|
| | B |
| − 93.0 | 100.0 |
| − 98.7 | 90.5 |
| −100.2 | 79.5 |
| −109.4 | 71.8 |
| −114.6 | 65.9 |
| −121.4 | 60.1 |
| −123.3 | 56.2 |
| −131.7 | 48.9 |
| −136.4 | 43.9 |
| −148.9 | 36.8 |
| | A + B |
| −161E | 27.3 |
| | A |
| −130.4 | 14.5 |
| −111.0 | 0.0 |

B = $CH_4O$
Methyl alcohol (9, 10)
*See* Fig. 1, p. 212

B = $C_2H_6$
Ethane (7)
*See* Fig. 2, p. 212

B = $C_2H_6O$
Methyl ether (4, 5, 69)
*See* Fig. 3, p. 212

B = $C_3H_6O_2$
Propionic acid (7, 9)
*See* Fig. 4, p. 212)

B = $C_4H_{10}O$
Ethyl ether (70)

| °C | Mol % A |
|---|---|
| | A |
| −112.0 | 100.0 |
| −114.0 | 99.3 |
| −116.5 | 98.0 |
| | $A_5B$ |
| −108.0 | 88.9 |
| − 93.0 | 86.0 |
| − 90.0 | 83.9 |
| − 89.0 | 83.5 |

B = $C_4H_{10}O$.—(*Continued*)

| °C | Mol % A |
|---|---|
| | $A_5B$ |
| − 90.0 | 82.4 |
| − 92.0 | 81.8 |
| − 96.0 | 80.0 |
| | $A_5B$ + $A_2B$ |
| −100.0E | 78.7 |
| | $A_2B$ |
| − 98.5 | 78.0 |
| − 93.0 | 76.7 |
| − 92.0 | 75.5 |
| − 90.0 | 73.4 |
| − 88.0 | 70.4 |
| − 88.0 | 67.2 |
| − **89.0** | **66.6** |
| − 95.0 | 64.3 |
| −100.0 | 63.6 |
| | AB |
| −104.0 | 60.4 |
| −100.0 | 59.8 |
| − 96.0 | 55.5 |
| − 95.0 | 53.9 |
| − 94.0 | 51.3 |
| − **93.0** | **50.0** |
| − 93.5 | 49.2 |
| − 97.0 | 46.8 |
| −100.0 | 44.4 |
| −105.0 | 41.5 |

B = $C_6H_7N$
Aniline (63)

| °C | Mol % B |
|---|---|
| Under 1 atm. | |
| | B |
| − 6.8 | 100.0 |
| | AB |
| − 7.3 | 98.0 |
| + 24.2 | 95.3 |
| 49.9 | 90.9 |
| 99.8 | 83.3 |
| 124.4 | 76.8 |
| 141.5 | 71.4 |
| 154.0 | 66.7 |
| 158.0 | 65.0 |
| 164.6 | 62.5 |
| 174.4 | 58.8 |
| 186.2 | 55.5 |
| 192.2 | 53.0 |
| 197.5 | 51.0 |
| 198.6 | 50.8 |
| **199.2** | **50.0** |
| Under the vapor pressure of the mixture | |
| | AB |
| 199.0 | 49.8 |
| 198.7 | 49.7 |
| + 11 | 19.6 |
| − 28 | 12.0 |
| − 62 | 5.3 |
| | A |
| −112.5 | 0 |

B = $C_6H_7N$.—(*Continued*)

| °C | Mol % B |
|---|---|
| Two liquid phases. Concentration and temperature limits | |
| 20.0 | 1.1 |
| 13.8 | 1.9 |
| 10.5 | 5.3 |
| 23.0 | 10.6 |

### HBr

B = $CH_3Cl$ (69)

| °C | Mol % A |
|---|---|
| | A |
| − 86.0 | 100.0 |
| − 95.0 | 91.0 |
| −101.0 | 83.6 |
| −106.0 | 75.0 |
| | A + B |
| *ca.* −115E | |
| | B |
| −105.0 | 49.8 |
| −101.5 | 47.0 |
| − 97.5 | 42.2 |
| − 92.0 | 35.0 |
| − 87.0 | 28.4 |
| − 78.0 | 18.4 |
| − 71.0 | 10.9 |
| − 69.5 | 9.9 |
| − 67.0 | 5.5 |
| − 62.5 | 0.0 |

B = $CH_4O$
Methyl alcohol (69)

| | |
|---|---|
| | A |
| − 86.0 | 100.0 |
| − 87.5 | 96.0 |
| − 94.0 | 89.0 |
| − 97.0 | 86.7 |
| | AB |
| − 85.0 | 76.6 |
| − 72.4 | 74.2 |
| − 58.0 | 70.8 |
| − 13.5 | 54.2 |
| − **12.0** | **50.0** |
| − 12.8 | 49.6 |
| − 33.9 | 42.3 |
| − 44.4 | 40.8 |
| − 54.5 | 34.5 |
| − 64.0 | 31.4 |

B = $C_2H_2$ (71)

| | |
|---|---|
| | B |
| − 81.8 | 0.0 |
| − 82.5 | 2.4 |
| − 85.7 | 4.5 |
| − 88.2 | 5.5 |
| − 93.2 | 9.2 |
| − 97.3 | 11.3 |
| −101.3 | 14.3 |
| −103.7 | 15.4 |
| −109.6 | 19.4 |
| −113.1 | 23.2 |
| −115.2 | 24.3 |
| −117.6 | 26.7 |
| −125.2 | 34.1 |

B = $C_2H_2$.—(*Cont'd*)

| °C | Mol % A |
|---|---|
| | A |
| −126.0 | 38.0 |
| −120.2 | 42.2 |
| −115.0 | 48.2 |
| − 86.0 | 100.0 |

B = $C_2H_6O$ (69)
Ethyl alcohol

| | |
|---|---|
| | A |
| − 86.0 | 100.0 |
| − 88.0 | 96.3 |
| − 91.5 | 92.2 |
| − 95.5 | 88.8 |
| − 97.0 | 87.3 |
| | A + AB |
| −104E | 85.4 |
| | AB |
| − 83.5 | 68.0 |
| − 62.5 | 66.6 |
| − 56.5 | 65.3 |
| − 50.1 | 63.5 |
| − 45.2 | 61.6 |
| − 40.5 | 59.8 |
| − 34.8 | 57.5 |
| − 33.3 | 55.6 |
| − 31.4 | 54.2 |
| − 30.3 | 52.7 |
| − 29.6 | 50.9 |
| − 28.5 | 50.3 |
| − 29.5 | 48.5 |
| − 30.0 | 46.0 |
| − 37.5 | 41.3 |
| − 40.0 | 41.0 |
| − 45.0 | 39.9 |
| − 54.0 | 38.0 |
| − 68.1 | 35.5 |
| − 73.4 | 35.2 |

B = $C_2H_6O$ (69)
Methyl ether

| | |
|---|---|
| | A |
| − 86.0 | 100.0 |
| − 86.8 | 97.6 |
| − 88.0 | 94.8 |
| − 90.2 | 89.7 |
| − 93.3 | 78.3 |
| − 95.2 | 76.1 |
| | A + AB |
| −100E | |
| | AB |
| − 74.3 | 65.5 |
| − 64.7 | 64.8 |
| − 42.0 | 61.6 |
| − 30.4 | 60.8 |
| − 26.3 | 59.7 |
| − 21.1 | 57.0 |
| − 14.4 | 52.3 |
| − **12.3** | **50.0** |
| − 13.0 | 48.5 |
| − 13.5 | 46.7 |
| − 14.3 | 43.8 |
| − 14.9 | 42.2 |
| − 16.6 | 38.9 |
| − 18.4 | 36.6 |
| − 18.7 | 35.7 |

B = $C_2H_6O$.—(*Continued*)

| °C | Mol % A |
|---|---|
| | AB |
| − 19.7 | 34.8 |
| − 26.3 | 23.8 |
| − 32.5 | 14.6 |
| − 35.5 | 11.8 |
| − 37.2 | 10.5 |
| − 46.3 | 8.15 |
| − 48.2 | 7.65 |
| − 61.0 | 4.72 |
| − 66.2 | 4.05 |
| − 75.0 | 3.32 |
| − 77.3 | 2.91 |
| − 99.8 | 1.73 |
| | B |
| −138.0 | 0.0 |

B = $C_3H_4$ (72)
Allylene

| | |
|---|---|
| | B |
| −105.0 | 0.0 |
| −112.3 | 17.9 |
| −121.5 | 29.0 |
| −129.5 | 37.1 |
| | AB |
| −129.1 | 40.2 |
| −127.2 | 43.5 |
| −126.5 | 47.4 |
| −126.1 | 49.3 |
| −127.6 | 54.2 |
| −128.8 | 58.4 |
| −134.0 | 68.6 |
| −137.5 | 73.7 |
| | A |
| −120.5 | 82.2 |
| −101.6 | 91.2 |
| − 86.0 | 100.0 |

B = $C_3H_6O$ (69)
Acetone

| | |
|---|---|
| | A |
| − 86.0 | 100.0 |
| − 86.8 | 98.2 |
| − 90.5 | 93.2 |
| − 94.0 | 88.5 |
| | AB |
| − 30.6 | 66.0 |
| − 19.3 | 64.6 |
| − 11.7 | 62.6 |
| − 6.0 | 59.0 |
| − 3.2 | 56.7 |
| − 3.0 | 52.2 |
| − 4.1 | 48.1 |
| − 5.8 | 39.0 |
| − 14.0 | 35.7 |
| − 14.0 | 32.6 |
| − 16.0 | 30.7 |
| − 24.2 | 28.0 |
| − 31.4 | 24.7 |
| − 36.0 | 23.2 |
| − 41.2 | 21.8 |
| − 50.5 | 19.4 |
| − 57.0 | 17.5 |
| − 61.0 | 16.3 |

B = $C_4H_8O_2$ (69)
Ethyl acetate

| °C | Mol % A |
|---|---|
| | A |
| −86.0 | 100.0 |
| −89.0 | 96.2 |
| −92.0 | 94.5 |
| −97.0 | 92.5 |
| | $A_4B$ |
| −85.2 | 84.9 |
| −71.3 | 83.8 |
| −69.2 | 83.6 |
| −69.2 | 82.7 |
| −67.1 | 82.1 |
| −63.0 | 81.0 |
| −61.0 | 80.4 |
| **−60.0** | **80.0** |
| −65.5 | 79.2 |
| | $A_4B$ + $A_5B_2$ |
| −68.1E | 78.4 |
| | $A_5B_2$ |
| −63.0 | 77.4 |
| −59.0 | 75.8 |
| −54.0 | 74.3 |
| −54.0 | 74.0 |
| −52.5 | 72.9 |
| **−52.0** | **71.4** |
| −52.5 | 70.1 |
| −52.5 | 70.0 |
| −53.0 | 69.8 |
| −57.0 | 68.0 |
| | $A_5B_2$ + AB |
| −59.0E | 65.8 |
| | AB |
| −56.0 | 65.0 |
| −51.0 | 62.6 |
| −45.0 | 60.8 |
| −41.0 | 58.2 |
| −39.0 | 57.2 |
| −37.0 | 55.1 |
| −36.1 | 53.2 |
| **−36.0** | **50.0** |
| −36.3 | 48.0 |
| −37.0 | 45.4 |
| −38.0 | 42.2 |
| −41.0 | 37.8 |
| −44.0 | 32.2 |
| −46.0 | 29.8 |
| −49.0 | 26.8 |
| −51.0 | 22.1 |
| −54.5 | 16.7 |
| −58.0 | 12.0 |
| −69.1 | 5.8 |
| | B |
| −83.0 | 0.0 |

B = $C_4H_{10}O$ (75)
Ethyl ether

| | |
|---|---|
| | B |
| −118 | 0.0 |
| | B + AB |
| −115E | |
| | AB |
| − 98 | 1.47 |
| − 92 | 2.00 |
| − 79 | 2.75 |
| − 69 | 7.56 |
| − 65 | 9.04 |

**B = $C_4H_{10}O$.—** *(Continued)*

| °C | Mol % A |
|---|---|
| AB | |
| − 61 | 10.6 |
| − 58.5 | 12.75 |
| − 54 | 15.10 |
| − 50.5 | 18.06 |
| − 46 | 21.85 |
| − 44 | 28.05 |
| − 43 | 39.4 |
| − **40** | **50.0** |
| $A_2B$ | |
| − **46** | **66.7** |
| − 64 | 74.2 |
| − 78 | 78.4 |
| − 94 | 82.3 |
| −100 | 84.7 |
| A | |
| − 98 | 93.5 |
| − 95 | 95.1 |
| − 91 | 97.9 |
| − 86 | 100.0 |

**B = $C_6H_6$ (71)**

| B | |
|---|---|
| 5.4 | 0 |
| + 1.3 | 5.7 |
| − 3.5 | 12.5 |
| − 4.0 | 13.5 |
| − 12.5 | 26.3 |
| − 20.5 | 32.7 |
| − 26.5 | 37.4 |
| − 31.0 | 41.1 |
| − 39.0 | 45.6 |
| − 40.0 | 47.2 |
| − 42.0 | 50.1 |
| − 47.0 | 56.2 |
| − 56.5 | 64.3 |
| − 65.0 | 72.8 |
| − 70.5 | 77.2 |
| − 79.5 | 85.2 |
| − 87.5 | 88.7 |
| A + B | |
| − 95.0E | 92.7 |
| A | |
| − 90.0 | 96.0 |
| − 86.0 | 100.0 |

**B = $C_7H_8$ (69)**
Toluene

| A | |
|---|---|
| − 86.0 | 100.0 |
| − 96.0 | 97.0 |
| −100.0 | 94.3 |
| −107.5 | 91.6 |
| −116.0 | 88.8 |
| −122.0 | 86.4 |
| −128 | 83.0 |
| A + $AB_2$ | |
| −130E | 81.4 |
| $AB_2$ | |
| −128 | 77.0 |
| −124 | 74.7 |
| −115 | 73.8 |
| −112.5 | 72.0 |
| −107.5 | 62.8 |
| −103.5 | 59.9 |

**B = $C_7H_8$.—** *(Cont'd)*

| °C | Mol % A |
|---|---|
| $AB_2$ | |
| − 98.0 | 54.7 |
| − 94.0 | 50.6 |
| − 92.0 | 48.1 |
| − 90.5 | 44.0 |
| − 88.5 | 39.9 |
| − 87.0 | 37.2 |
| − 87.0 | 32.5 |
| − 88.5 | 29.1 |
| − 89.5 | 24.9 |
| − 94.0 | 21.1 |
| − 95.0 | 18.1 |
| $AB_2$ + B | |
| −100.0E | 13.7 |
| B | |
| − 98.0 | 5.5 |
| − 94.0 | 0.0 |

**B = $C_7H_{14}$ (67)**
Methylcyclohexane

| °C | Mol % B |
|---|---|
| A | |
| − 86.0 | 0.0 |
| − 87.9 | 2.0 |
| − 89.9 | 4.0 |
| − 91.4 | 6.0 |
| − 92.5 | 7.9 |
| − 93.9 | 10.1 |
| − 96.3 | 15.6 |
| − 97.8 | 19.6 |
| −100.4 | 25.2 |
| −101.9 | 28.8 |
| −103.4 | 32.6 |
| −105.3 | 37.5 |
| −107.6 | 43.4 |
| −110.0 | 49.9 |
| −111.8 | 54.2 |
| −113.8 | 59.7 |
| vis. | 60–100 |
| B | |
| −124.5 | 100.0 |

**B = $C_8H_{10}$ (71)**
Ethylbenzene

| °C | Mol % A |
|---|---|
| B | |
| − 92.4 | 0.00 |
| − 97.7 | 11.5 |
| −103.6 | 24.0 |
| $AB_2$ | |
| −104.0 | 31.9 |
| −**103.8** | **33.3** |
| −104.0 | 34.4 |
| −110.2 | 40.1 |
| AB | |
| −118.5m | 28.5 |
| −115.2m | 32.0 |
| −112.6m | 34.5 |
| −109.2 | 42.7 |
| −106.0 | 46.6 |
| −**105.5** | **50.0** |
| −106.3 | 52.4 |
| −108.8 | 59.1 |
| −112.2 | 64.4 |
| −116.7 | 71.4 |
| −120.5 | 75.4 |
| −125.2 | 79.9 |

**B = $C_8H_{10}$.—** *(Continued)*

| °C | Mol % A |
|---|---|
| A | |
| −125.0 | 83.8 |
| −105.8 | 88.4 |
| − 96.5 | 92.7 |
| − 90.8 | 96.3 |
| − 86.0 | 100.0 |

**B = $C_8H_{10}$ (67)**
*o*-Xylene

| °C | Mol % B |
|---|---|
| A | |
| − 86.0 | 0.0 |
| − 92.0 | 3.1 |
| − 96.5 | 6.6 |
| −111.0 | 12.1 |
| A + B | |
| −116E | 14.0 |
| B | |
| −114.0 | 14.9 |
| −107.0 | 19.0 |
| − 96.5 | 25.3 |
| − 91.0 | 28.1 |
| − 89.1 | 30.8 |
| − 85.7 | 34.7 |
| − 83.6 | 38.0 |
| − 76.2 | 42.7 |
| − 74.5 | 46.0 |
| − 68.5 | 49.3 |
| − 65.5 | 52.3 |
| − 64.5 | 55.3 |
| − 61.5 | 58.3 |
| − 57.5 | 62.2 |
| − 56.0 | 65.2 |
| − 52.5 | 69.5 |
| − 48.5 | 73.8 |
| − 47.5 | 79.0 |
| − 45.5 | 83.7 |
| − 44.0 | 87.3 |
| − 42.0 | 91.8 |
| − 40.0 | 95.8 |
| − 38.5 | 100.0 |

**B = $C_8H_{10}$ (67)**
*m*-Xylene

| A | |
|---|---|
| − 86.0 | 0.0 |
| AB | |
| −111.1 | 13.1 |
| − 88.6 | 24.8 |
| − 86.9 | 27.6 |
| − 83.7 | 35.6 |
| − 80.8 | 36.9 |
| − 79.0 | 41.8 |
| − 78.2 | 43.5 |
| − 77.7 | 44.8 |
| − 77.5 | 48.1 |
| − 77.6 | 49.3 |
| A | |
| − 75.5 | 51.8 |
| − 73.5 | 53.1 |
| − 68.8 | 58.0 |
| − 63.2 | 66.7 |
| − 58.4 | 75.5 |
| − 54.9 | 86.9 |
| − 54.0 | 100.0 |

**B = $C_8H_{10}$ (67)**
*p*-Xylene

| °C | Mol % B |
|---|---|
| A | |
| − 86.0 | 0.0 |
| − 93.5 | 4.5 |
| − 97.1 | 7.0 |
| −101.4 | 10.6 |
| B | |
| − 76.8 | 20.3 |
| − 62.1 | 25.5 |
| − 48.1 | 31.1 |
| − 21.0 | 34.8 |
| − 26.0 | 43.5 |
| − 20.8 | 48.2 |
| − 15.9 | 52.0 |
| − 10.8 | 56.9 |
| − 1.5 | 69.5 |
| + 5.7 | 82.0 |
| 9.4 | 86.5 |
| 11.5 | 92.3 |
| 15.0 | 100.0 |

**B = $C_9H_{12}$ (71)**
Mesitylene

| °C | Mol % A |
|---|---|
| B | |
| − 53.5 | 0.0 |
| − 56.5 | 4.0 |
| − 57.5 | 6.5 |
| − 65.5 | 16.3 |
| − 68.5 | 25.2 |
| − 66.5 | 33.8 |
| − 64.5 | 39.2 |
| AB | |
| − 63.0 | 44.4 |
| − **61.5** | **50.0** |
| − 61.7 | 51.3 |
| − 61.7 | 58.5 |
| − 62.2 | 59.9 |
| − 62.5 | 61.4 |
| − 67.5 | 65.3 |
| − 68.4 | 67.1 |
| − 82.0 | 76.0 |
| − 90.0 | 79.8 |
| −103.5 | 84.0 |
| A | |
| −105.0 | 89.0 |
| − 98.5 | 93.9 |
| − 86.0 | 100.0 |

**B = $C_9H_{12}$ (67)**
*n*-Propylbenzene

| °C | Mol % B |
|---|---|
| A | |
| − 86.0 | 0.0 |
| − 88.3 | 2.1 |
| − 92.6 | 4.5 |
| − 97.9 | 8.0 |
| −107.8 | 12.0 |
| −119.1 | 15.8 |
| AB | |
| −119.4 | 19.4 |
| −116.8 | 23.2 |
| −115.4 | 25.2 |
| −114.4 | 27.9 |
| −113.5 | 31.5 |
| −109.3 | 35.3 |

**B = $C_9H_{12}$.—** *(Continued)*

| °C | Mol % B |
|---|---|
| AB | |
| −107.4 | 38.1 |
| −106.1 | 41.6 |
| −105.2 | 46.2 |
| −105.4 | 50.1 |
| −105.9 | 54.3 |
| −106.5 | 58.5 |
| −110.3 | 62.6 |
| −113.4 | 65.5 |
| B | |
| −145.0 | 100.0 |

## HI

**B = $C_2H_6O$ (69)**
Methyl ether

| °C | Mol % A |
|---|---|
| A | |
| − 50.9 | 100.0 |
| − 53.4 | 96.7 |
| − 64.1 | 89.8 |
| − 77.0m | 72.7 |
| A + AB | |
| −78E | 72.5 |
| AB | |
| − 47.5 | 65.5 |
| − 40.7 | 58.7 |
| − 35.7 | 56.1 |
| − 30.8 | 53.8 |
| − 26.3 | 52.5 |
| − **21** | **50.0** |
| − 22.0 | 45.7 |
| ? | |
| − 25.0 | 27.2 |
| − 35.0 | 12.3 |
| − 56.0 | 6.1 |

## $SO_2$

**B = $CO_2$** crys. (148)
At −78.59°C, Mol % B = 33.6 in satd. soln.; = 99.72 in satd. vapor

**B = $CCl_4$ (19); *cf.* (168)**

| °C | Wt. % B |
|---|---|
| B | |
| − 66.1 | 5.24 |
| − 57.9 | 8.42 |
| − 47.2 | 16.44 |
| (−45)* | (20) |
| Two liquid phases | |
| (−45)* | (20) (93) |
| −35.2 | 31.66 |
| −39.8 | 88.44 |
| −33.6 | 80.83 |
| −29.8 | 66.26 |
| −29.7 | 49.93 |
| −29.3† | (55) (55) |
| B | |
| −30.58 | 97.8 |
| −26.78 | 98.8 |
| −24.8 | 100 |

* Quadruple points. † Critical solution temp.

**B = $CH_4O$ (10)**
Methyl alcohol
*See* Fig. 5, p. 212

**B = $C_2H_6O$ (5)**
Methyl ether

| °C | Mol % B |
|---|---|
| A | |
| − 72.3 | 0 |
| A + AB | |
| −109E | 34 |
| AB | |
| − **91.5** | **50** |
| AB + B | |
| −144E | 88.5 |
| B | |
| −138.5 | 100 |

**B = $C_6H_{12}$ (141)**
Cyclohexane

| °C | Mol % A |
|---|---|
| B | |
| + 6.4 | 0.00 |
| − 4.3 | 5.18 |
| Two liquids (interpolated) | |
| −17.0 | 12.1 97.0 |
| − 7.0 | 17.7 94.9 |
| 0.0 | 23.9 92.8 |
| + 7.0 | 33.6 88.2 |
| 11.4 | 44.1 80.0 |
| 13.4 | 65.6 71.2 |
| 13.6 crit. *ca.* | 69.2 |
| B | |
| −24.3 | 97.7 |
| −34.3 | 98.1 |
| −51.0 | 98.9 |
| −56.0 | 99.2 |
| −60.0 | 99.4 |
| −64.5 | 99.6 |
| A + B | |
| −72.5E | 99.95 |
| A | |
| −72.3 | 100.0 |

**B = $C_{10}H_{16}O$ (14)**
Camphor

| °C | Mol % B |
|---|---|
| A | |
| − 76 | 0.0 |
| − 77 | 1.36 |
| − 78 | 2.83 |
| − 79 | 4.05 |
| − 80 | 6.16 |
| − 81 | 8.15 |
| A + $A_2B$ | |
| − 82E | 10.6 |
| $A_2B$ | |
| − 80 | 11.5 |
| − 77 | 13.0 |
| − 75 | 14.3 |
| − 71 | 16.4 |
| − 64 | 20.4 |
| − 59 | 23.5 |
| − 54 | 27.0 |
| − 49 | 30.5 |
| − 46 | 32 7 |
| − 45 3 | 33 5 |

$SO_2$.—(*Cont'd*)

$C_{10}H_{16}O$.—
(*Continued*)

| °C | Mol % B |
|---|---|
| A₂B + AB | |
| − 46E | 34.1 |
| AB | |
| − 45 | 34.5 |
| − 44 | 35.4 |
| − 41.5 | 36.8 |
| − 38.5 | 38.7 |
| − 36 | 40.3 |
| − 33.5 | 41.3 |
| − 28 | 45.5 |
| − 25 | 48.0 |
| − 24.5 | 49.6 |
| − 25.5 | 52.4 |
| − 27 | 57.4 |
| B | |
| − 25 | 58.2 |
| − 23 | 59.5 |
| − 16 | 61.8 |
| − 13 | 63.5 |
| +178 | 100.0 |

B = $C_{16}H_{34}O$ (140.5)
Cetyl alcohol

| °C | Wt. % A |
|---|---|
| 5.3 | 99.58 |
| 22.2 | 92.30 |
| 22.6 | 89.58 |
| 22.7 | 88.80 |
| 23.8 | 71.66 |
| 23.5 | 68.82 |
| 23.9 | 65.13 |
| 24.8 | 53.61 |
| 25.5 | 42.54 |
| 27.8 | 33.73 |
| 30.9 | 21.07 |
| 41.6 | 4.15 |

## $H_2S$

B = $CO_2$ (148)
At −75.17°, Mol % B = 25.4 in satd. soln.; = 75.3 in satd. vapor

B = $CH_4O$ (11)
Methyl alcohol
*See* Fig. 6, p. 212

B = $C_2H_6O$ (11)
Methyl ether
*See* Fig. 7, p. 212

## $H_2SO_4$

B = $C_2HCl_3O_2$ (52)
Trichloroacetic acid
Stable

| °C | Mol % B |
|---|---|
| A | |
| 10.3 | 0.0 |
| 7.5 | 2.9 |
| A + α-B | |
| 3 | 7.0 |
| α-B | |
| 15.5 | 11.3 |
| 21.6 | 14.1 |

B = $C_2HCl_3O_2$.—
(*Continued*)

| °C | Mol % B |
|---|---|
| α-B | |
| 29.0 | 17.9 |
| 31.7 | 21.0 |
| 35.3 | 24.9 |
| 39.5 | 26.1 |
| 39.2 | 30.8 |
| 41.9 | 33.2 |
| 42.6 | 37.7 |
| 44.8 | 41.7 |
| 47.0 | 49.5 |
| 47.0 | 54.0 |
| 49.2 | 58.3 |
| 51.2 | 68.2 |
| 53.4 | 78.1 |
| 56.1 | 89.3 |
| 57.3 | 100.0 |
| Metastable | |
| A + β-B | |
| 1.0mE | 7.8 |
| β-B | |
| 13.4m | 13.4 |
| 20.2m | 17.8 |
| 24.0m | 21.9 |
| 33.8m | 32.9 |
| 38.4m | 43.9 |

B = $C_2H_3ClO_2$ (52)
Chloroacetic acid

| B | |
|---|---|
| 9.2 | 46.0 |
| 25.2 | 53.7 |
| 34.5 | 59.7 |
| 38.1 | 62.3 |
| 41.1 | 65.1 |
| 52.7 | 78.9 |
| 57.8 | 88.1 |
| 60.5 | 94.4 |
| 61.7 | 100.0 |

B = $C_4H_5ClO_2$ (52)
α-Chlorocrotonic acid

| B | |
|---|---|
| 2.0 | 31.0 |
| 30.0 | 39.0 |
| 41.0 | 43.9 |
| 49.5 | 48.1 |
| 58.5 | 52.8 |
| 64.0 | 56.6 |
| 73.2 | 63.5 |
| 79.5 | 69.4 |
| 86.5 | 80.2 |
| 93.5 | 90.4 |
| 99.0 | 100.0 |

B = $C_4H_6O_2$ (52)
Crotonic acid

| AB | |
|---|---|
| 1.5 | 33.7 |
| 15.8 | 38.1 |
| 23.3 | 43.5 |
| 24.5 | 49.7 |
| 21.3 | 54.9 |
| AB + B | |
| 18E | 58 |

B = $C_4H_6O_2$.—
(*Continued*)

| °C | Mol % B |
|---|---|
| B | |
| 22.3 | 59.3 |
| 40.4 | 65.9 |
| 47.0 | 69.1 |
| 54.7 | 74.6 |
| 61.9 | 83.5 |
| 67.5 | 93.8 |
| 71.0 | 100.0 |

B = $C_5H_8O_4$ (52)
Glutaric acid

| AB | |
|---|---|
| 40.1 | 33.5 |
| 46.0 | 39.0 |
| 47.7 | 41.6 |
| 49.7 | 45.5 |
| **50.5** | **50** |
| AB + B | |
| 49E | 53 |
| B | |
| 35.0m | 47.8 |
| 37.1m | 49.0 |
| 51.7 | 54.1 |
| 63.9 | 59.6 |
| 75.7 | 65.2 |
| 82.5 | 70.9 |
| 88.6 | 78.8 |
| 92.9 | 87.4 |
| 95.8 | 100.0 |

B = $C_6H_5NO_3$ (52)
*o*-Nitrophenol

| B | |
|---|---|
| 11.0 | 25.8 |
| 21.0 | 32.0 |
| 30.0 | 40.7 |
| 33.5 | 45.6 |
| 37.0 | 52.6 |
| 39.3 | 59.3 |
| 39.1 | 66.5 |
| 39.5 | 68.9 |
| 40.7 | 75.7 |
| 42.4 | 88.0 |
| 45.0 | 100.0 |

B = $C_6H_5NO_3$ (52)
*m*-Nitrophenol

| $AB_2$ | |
|---|---|
| 18.0 | 24.7 |
| 39.4 | 31.7 |
| 52.2 | 37.7 |
| 62.3 | 45.9 |
| 69.4 | 51.4 |
| 73.5 | 55.2 |
| 78.6 | 60.5 |
| **83** | **66.6** |
| 82.7 | 68.5 |
| 81.7 | 73.5 |
| $AB_2$ + B | |
| 80E | 77 |
| B | |
| 84.7 | 82.0 |
| 89.4 | 87.7 |
| 92.5 | 93.3 |
| 95.4 | 100.0 |

B = $C_6H_5NO_3$ (52)
*p*-Nitrophenol

| °C | Mol % B |
|---|---|
| $AB_2$ | |
| 35.1 | 35.6 |
| 60.3 | 44.7 |
| 70.4 | 50.6 |
| 73.5 | 53.0 |
| 80.7 | 58.4 |
| 88.3 | 64.1 |
| **90** | **66.6** |
| 89.9 | 68.1 |
| $AB_2$ + B | |
| 87E | 70 |
| B | |
| 97.0 | 76.9 |
| 102.7 | 83.9 |
| 109.4 | 92.7 |
| 113.8 | 100.0 |

B = $C_6H_6O$ (52)
Phenol

| $AB_2$ | |
|---|---|
| −10.0 | 34.1 |
| − 7.0 | 36.3 |
| − 2.0 | 39.5 |
| + 2.5 | 42.7 |
| 6.0 | 45.7 |
| 8.0 | 49.5 |
| 10.4 | 51.8 |
| 12.2 | 55.4 |
| 14.5 | 61.3 |
| **15.5** | **66.6** |
| $AB_2$ + B | |
| 10E | 70 |
| B | |
| 13.4 | 72.0 |
| 23.4 | 79.4 |
| 30.5 | 86.6 |
| 35.5 | 94.1 |
| 42.4 | 100.0 |

B = $C_7H_5NO_3$ (52)
*p*-Nitrobenzaldehyde

| B | |
|---|---|
| 104.4 | 100.0 |
| 100.7 | 90.6 |
| 94.8 | 79.7 |
| 90.9 | 73.2 |
| 85.0 | 65.0 |
| 76.6 | 55.4 |
| 74.5 | 49.7 |
| 74.8 | 49.5 |
| 73.0 | 47.3 |
| 70.4 | 43.9 |
| 67.1 | 41.1 |
| 66.7 | 40.2 |
| 54.0 | 34.5 |
| 56.5 | 33.7 |
| 32.6 | 24.1 |

B = $C_7H_6O_2$ (52)
Benzoic acid

| B | |
|---|---|
| 121.8 | 100.0 |
| 120.6 | 98.0 |
| 115.8 | 92 1 |

B = $C_7H_6O_2$.—
(*Continued*)

| °C | Mol % B |
|---|---|
| B | |
| 109.6 | 83.9 |
| 92.5 | 69.1 |
| 90.0 | 67.4 |
| AB + B | |
| 81.5E | 61.5 |
| AB | |
| 82.3 | 60.2 |
| 84.2 | 56.9 |
| 86.2 | 51.8 |
| **87.5** | **50.0** |
| 86.3 | 44.3 |
| 83.2 | 39.2 |
| 77.2 | 34.2 |
| 72.3 | 30.8 |
| 61.4 | 26.2 |
| 53.2 | 24.2 |
| 44.6 | 22.6 |
| +25.8 | 18.6 |
| AB + A | |
| −10E | 12 |
| A | |
| − 6.2 | 9.9 |
| − 1.2 | 8.0 |
| + 3.2 | 5.7 |
| 7.0 | 3.2 |
| 10.3 | 0.0 |

B = $C_7H_8O$ (52)
*o*-Cresol

| B | |
|---|---|
| 30.4 | 100.0 |
| 26.2 | 89.1 |
| 18.8 | 76.8 |
| 9.6 | 68.7 |
| 6.2 | 66.2 |
| 1.0 | 61.9 |

B = $C_7H_8O$ (52)
*p*-Cresol

| B | |
|---|---|
| 34.6 | 100.0 |
| 29.4 | 90.4 |
| 22.1 | 82.2 |
| 11.6 | 75.4 |
| B + $AB_2$ | |
| 7E | 72.5 |
| $AB_2$ | |
| 11.0 | 68.0 |
| **12.0** | **66.6** |
| 11.0 | 62.6 |
| 7.5m | 54.1 |
| 5.0m | 50.5 |
| $AB_2$ + $A_2B$ | |
| 9.3E | 58.5 |
| $A_2B$ | |
| 24.0 | 56.0 |
| 57.3 | 48.7 |
| 84.1 | 39.5 |
| 91.9 | 34.7 |
| 93.4 | 33.8 |
| 90.9 | 28.6 |
| 78.2 | 21.6 |
| 57.8 | 16.2 |
| 40.2 | 12.5 |

B = $C_7H_8O_2$ (52)
Dimethylpyrone

| °C | Mol % B |
|---|---|
| B | |
| 132.0 | 100.0 |
| 124.0 | 85.4 |
| 115.0 | 76.1 |
| 109.0 | 71.5 |
| B + $AB_2$ | |
| 103E | 68.5 |
| $AB_2$ | |
| **103.6** | **66.7** |
| 101.8 | 63.5 |
| 100.2 | 61.1 |
| 90.4 | 57.3 |
| $AB_2$ + AB | |
| 84.2E | 55.5 |
| AB | |
| 88.1 | 53.0 |
| 93.4 | 51.3 |
| **96.0** | **50.0** |
| 93.4 | 47.1 |
| 90.9 | 46.2 |
| 72.5 | 43.3 |
| 56.0 | 41.8 |
| 41.6 | 40.5 |
| AB + $A_3B_2$ | |
| 36.6E | 40 |
| $A_3B_2$ | |
| **44.8** | **40** |
| 44.3 | 39.5 |
| 43.1 | 38.3 |
| 37.6 | 36.1 |
| 29.3 | 34.1 |
| 18.2 | 32.2 |
| 6.0 | 30.4 |

B = $C_8H_8O$ (52)
Acetophenone

| B | |
|---|---|
| 18.7 | 100.0 |
| 17.2 | 95.8 |
| 17.4 | 95.2 |
| B + $AB_2$ | |
| 13.9E | 89.0 |
| $AB_2$ | |
| 17.6 | 86.3 |
| 23.8 | 80.8 |
| 28.4 | 69.0 |
| **29** | **66.7** |
| 28.0 | 63.0 |
| 25.0 | 59.9 |
| 22.5 | 54.9 |
| 18.5 | 51.1 |

B = $C_8H_8O_2$ (52)
Phenylacetic acid

| A | |
|---|---|
| 10.3 | **0.0** |
| + 5.6 | **2.5** |
| − 3.0 | **5.1** |
| AB + A | |
| − 9.0E | **6.8** |
| AB | |
| +15.8 | **16.3** |
| 47.7 | **28.7** |
| 55.0 | **36.2** |

### B = $C_8H_8O_2$.— (*Continued*)

| °C | Mol % B |
|---|---|
| AB | |
| 58.7 | 37.9 |
| 60.0 | 39.5 |
| 60.7 | 42.6 |
| 61.2 | 45.1 |
| **61.8** | **50.0** |
| 60.0 | 53.7 |
| 58.4 | 56.3 |
| AB + B | |
| 40.6 | 61.6 |
| B | |
| 50.1 | 65.3 |
| 53.2 | 67.1 |
| 55.0 | 68.7 |
| 56.8 | 69.9 |
| 59.4 | 71.6 |
| 67.7 | 83.8 |
| 71.5 | 91.1 |
| 76.8 | 100.0 |

### B = $C_8H_8O_2$ (52)
*o*-Toluic acid

| B | |
|---|---|
| 102.9 | 100.0 |
| 97.8 | 88.7 |
| 92.0 | 78.0 |
| 83.6 | 68.1 |
| 82.2 | 66.7 |
| 74.2 | 61.1 |
| 67.0 | 58.1 |
| B + AB | |
| 57.5E | 55 |
| AB | |
| 58.7 | 51.9 |
| **59** | **50.0** |
| 58.2 | 47.4 |
| 57.6 | 44.3 |
| 56.3 | 39.5 |
| 54.6 | 37.0 |
| 49.1 | 33.6 |
| 45.6 | 30.7 |
| 33.5 | 25.6 |
| +12.0 | 20.1 |
| AB + A | |
| −14E | 16 |
| A | |
| + 3.0 | 4.6 |
| 7.2 | 2.4 |
| 10.3 | 0.0 |

### B = $C_8H_8O_2$ (52)
*m*-Toluic acid

| B | |
|---|---|
| 110.0 | 100.0 |
| 100.5 | 84.5 |
| 92.0 | 74.3 |
| 83.6 | 67.7 |
| 78.7m | 64.1 |
| 74.9m | 61.8 |
| B + $AB_2$ | |
| 79.3U | 64.7 |

### B = $C_8H_8O_2$.— (*Continued*)

| °C | Mol % B |
|---|---|
| $AB_2$ | |
| **79.5** | **66.7** |
| 78.9 | 61.8 |
| 78.3 | 60.2 |
| 78.3 | 59.5 |
| 78.0 | 58.7 |
| 76.2 | 55.6 |
| 75.9 | 54.1 |
| 72.2 | 50.9 |
| 71.6 | 49.9 |
| 68.8 | 47.1 |
| 62.3m | 45.0 |
| 36.2m | 36.3 |
| $AB_2$ + AB | |
| 62.5U | 46 |
| AB | |
| **63.5m** | **50** |
| 61.8 | 42.5 |
| 58.4 | 39.7 |
| 55.6 | 36.4 |
| 54.0 | 34.8 |
| 52.7 | 34.0 |
| 46.5 | 30.8 |
| 37.5 | 27.1 |
| 20.8 | 22.4 |
| AB + A | |
| 19.0E | 16 |
| A | |
| − 1.8 | 7.7 |
| + 7.3 | 2.4 |
| 10.3 | 0.0 |

### B = $C_8H_8O_2$ (52)
*p*-Toluic acid

| A | |
|---|---|
| 10.3 | 0.0 |
| 5.8 | 1.7 |
| + 3.0 | 3.2 |
| − 2.2 | 6.2 |
| AB + A | |
| −15E | 13 |
| AB | |
| + 7.5 | 14.7 |
| 18.0 | 16.8 |
| 53.0 | 21.2 |
| 58.7 | 23.0 |
| 77.5 | 28.1 |
| 88.5 | 32.8 |
| 94.9 | 37.1 |
| 98.9 | 42.2 |
| 99.5 | 45.5 |
| AB + B | |
| 100U | 46 |
| B | |
| 100.2 | 46.8 |
| 111.2 | 49.6 |
| 116.0 | 51.3 |
| 127.0 | 55.2 |
| 137.5 | 59.6 |
| 143.7 | 62.9 |
| 154.7 | 71.0 |
| 167.5 | 84.2 |
| 180.2 | 100.0 |

### B = $C_8H_{10}O$ (52)
3, 4-Dimethylphenol

| $A_2B$ | |
|---|---|
| 58.3 | 16.1 |
| 72.8 | 20.3 |
| 84.8 | 25.3 |
| 89.4 | 30.4 |
| **90.0** | **33.3** |
| 80.7 | 41.5 |
| 71.5 | 44.6 |
| 60.8 | 47.8 |
| $A_2B$ + $AB_2$ | |
| 53.8E | 50.7 |
| $AB_2$ | |
| 63.4 | 54.4 |
| 68.9 | 60.2 |
| **70.0** | **66.6** |
| 68.0 | 70.9 |
| $AB_2$ + B | |
| 50E | 80 |
| B | |
| 31.6 | 63.7 |
| 42.4 | 72.1 |
| 47.0 | 75.8 |
| 57.6 | 87.5 |
| 63.7 | 100.0 |

### B = $C_8H_{10}O$ (52)
2, 5-Dimethylphenol

| $A_2B$ | |
|---|---|
| 91.9 | 24.7 |
| **104.0** | **33.3** |
| 100.0 | 40.1 |
| 92.4 | 46.4 |
| $A_2B$ + AB | |
| 90.5E | 48 |
| AB | |
| **91.0** | **50** |
| 90.4 | 54.0 |
| 87.2 | 61.7 |
| 84.2 | 67.0 |
| 80.6 | 71.7 |
| AB + B | |
| 67.9E | 81.1 |
| B | |
| 71.0 | 91.1 |
| 74.0 | 100.0 |

### B = $C_8H_6O_2$ (52)
Coumarin

| AB | |
|---|---|
| 14.0 | 35.2 |
| 24.0 | 38.4 |
| 32.3 | 42.6 |
| 34.5 | 46.2 |
| **35.5** | **50.0** |
| 32.7 | 54.2 |
| AB + B | |
| 29E | 57 |
| B | |
| 30.8 | 58.4 |
| 40.4 | 63.5 |
| 46.5 | 68.3 |
| 51.2 | 73.1 |

### B = $C_9H_6O_2$.— (*Continued*)

| B | |
|---|---|
| 53.4 | 80.7 |
| 62.3 | 89.2 |
| 68.4 | 100.0 |

### B = $C_{10}H_{14}O$ (52)
Thymol

| B | |
|---|---|
| 42m | 64.7 |
| 42m | 72.2 |
| 43m | 83.3 |
| 47.1 | 92.4 |
| 49.6 | 100.0 |

### B = $C_{13}H_{10}O$ (52)
Benzophenone

| AB | |
|---|---|
| 39.1 | 29.6 |
| 48.7 | 32.6 |
| 55.2 | 35.7 |
| 59.4 | 38.8 |
| 61.9 | 42.6 |
| 63.9 | 46.2 |
| **64** | **50** |
| 63.0 | 54.1 |
| 56.6 | 64.5 |
| AB + B | |
| 26.5E | 70.9 |
| B | |
| 38.0 | 79.8 |
| 42.1 | 88.7 |
| 44.5 | 92.9 |
| 46.4 | 96.4 |
| 47.8 | 100.0 |

### B = $C_{14}H_{10}O_3$ (52)
Benzoic anhydride

| $A_2B$ | |
|---|---|
| 25.0 | 15.8 |
| 55.4 | 26.5 |
| 58.7 | 31.5 |
| **60** | **33.3** |
| 58.7 | 36.1 |
| $A_2B$ + AB | |
| 58.3E | 37.4 |
| AB | |
| 59.1 | 37.8 |
| 67.6 | 43.7 |
| **70.5** | **50** |
| 69.4 | 55.4 |
| 64.3 | 62.2 |
| 57.3 | 67.6 |
| AB + $AB_2$ | |
| 51.3U | 72 |
| $AB_2$ | |
| 51.0 | 73.5 |
| 50.0 | 77.2 |
| 49.2 | 81.0 |
| 45.3 | 85.7 |
| 42.3 | 90.2 |
| 38.9 | 94.8 |
| $AB_2$ + B | |
| 37E | 97 |
| B | |
| 39.5 | 100 |

## $SO_2Cl_2$

### B = $C_6H_{10}O_6$ (49)
Dimethyl tartrate

| °C | Mol % B |
|---|---|
| B | |
| −38 | 100 |
| −39 | 98.3 |
| −41 | 91.6 |
| −43.5 | 87.9 |
| ? | |
| −43.5 | 84.7 |
| −41.0 | 80.6 |

### B = $C_7H_{12}O_5$ (49)
Diethyl malonate

| B | |
|---|---|
| −88 | 100 |
| −90 | 96.73 |
| A? | |
| −82 | 91.66 |
| −74 | 88.59 |
| vis. | 88 − 0 |

## NO

### B = $C_2H_6O$ (8)
Methyl ether

*See* Fig. 8, p. 212

## $N_2O_4$

### B = $C_7H_7NO_2$ (21)
*o*-Nitrotoluene

| °C | Mol % B |
|---|---|
| A | |
| −40 | 20 |
| −45 | 27 |
| −50 | 32.5 |
| −55 | 37 |
| A + $AB_2$ | |
| −56.5E | 38.5 |
| $AB_2$ | |
| −55 | 40 |
| −50 | 46.5 |
| −47.5 | 50 |
| **−44m** | **66.6** |
| $AB_2$ + B | |
| −46U | 54.5 |
| B | |
| −40 | 58 |
| −35 | 61.5 |
| −30 | 65 |
| −25 | 70 |
| −20 | 75 |
| −15 | 82.5 |
| −10 | 93 |
| − 7 | 100 |

### B = $C_{10}H_{16}O$ (126)
Camphor

| °C | | Mol % A |
|---|---|---|
| $t_L$ | $t_S$ | |
| A-rich mix. crys. | | |
| −10.2 | −10.2 | 100.0 |
| −10.8 | −12.0 | 97.0 |
| −12.5 | −16.5 | 93.7 |
| −15.5 | −24.5 | 88.3 |
| −21.5 | −42.5 | 83.3 |
| −29.0 | −60.0 | 80.0 |
| −37.6 | −60.0 | 75.4 |
| −46.5 | −60.0 | 73.5 |

### B = $C_{10}H_{16}O$.— (*Continued*)

| °C | Mol % A |
|---|---|
| 81.8 Mol % A mix. crys. + $A_5B_4$ | |
| −60.0E | 71.0 |
| $A_5B_4$ | |
| −56.5 | 65.1 |
| −53.5 | 62.3 |
| −52.3 | 57.4 |
| −52.1 | 54.9 |
| −52.2 | 52.4 |
| −53.5 | 48.2 |
| −55.0 | 46.9 |
| −50.0 | 46.5 |
| $A_5B_4$ + $A_2B_3$ | |
| −55.5E | 45.5 |
| $A_2B_3$ | |
| −46.00 | 42.6 |
| −45.7 | 41.5 |
| −45.5 | 38.9 |
| $A_2B_3$ + B | |
| −46.5E | 36.8 |
| B | |
| −38.2 | 34.3 |
| −31.46 | 31.7 |
| −17 | 29.5 |
| (179) | 0.0 |

## $NH_3$

### B = $CH_4O$ (11)
Methyl alcohol

*See* Fig. 9, p. 212

### B = $C_2H_6O$ (11)
Methyl ether

*See* Fig. 10, p. 212

## $H_3PO_4$

### B = $C_4H_{10}O$ (135)
Ether

| °C | Mol % B |
|---|---|
| A | |
| 38.4* | 0.00 |
| 30.1 | 1.98 |
| 28.7 | 2.72 |
| 28.3 | 2.83 |
| 26.5 | 3.68 |
| 23.4 | 5.02 |
| 21.0 | 6.38 |
| 17.7 | 9.70 |
| 17.5 | 9.89 |
| 16.9 | 10.7 |
| A + $A_6B$ | |
| 16.0E | 12.7 |
| $A_6B$ | |
| 17.5 | 13.0 |
| 22.1 | 13.45 |
| 25.5 | 13.95 |
| 27.5 | 14.15 |
| **28.2** | **14.32** |
| 28.0 | 14.65 |
| 25.2 | 15.10 |
| 24.5 | 15.16 |

* The acid contains 0.1–0.15 % $H_2O$. The M. P. of the pure acid must, therefore, be somewhat higher.

### $H_3PO_4$.—(*Cont'd*)

$B = C_4H_{10}O$.—(*Continued*)

| °C | Mol % B |
|---|---|
| $A_6B + A_4B$ | |
| 22E | |
| $A_4B$ | |
| 23.9 | 15.58 |
| 25.0 | 15.66 |
| 25.2 | 15.94 |
| 27.5 | 16.54 |
| 28.4 | 17.50 |
| 29.8 | 18.94 |
| 30.0 | 19.68 |
| **29.3** | **19.90** |
| 17.2 | 20.72 |
| 14.0 | 21.95 |

### $P_4S_3$

$B = CS_2$ (145)

| °C | Mol % A |
|---|---|
| A? | |
| −20 | 3.70 |
| 0 | 8.54 |
| +17 | 25.7 |

$B = C_6H_6$ (145)

| A? | |
|---|---|
| 17 | 0.88 |
| 80 | 3.80 |

$B = C_7H_8$ (145) Toluene

| A? | |
|---|---|
| 17 | 1.41 |
| 111 | 6.04 |

### $AsBr_3$

$B = C_3H_7NO_2$* (134) Urethane

| °C | Mol % B |
|---|---|
| A | |
| 31 | 0 |
| A + B | |
| 4.4E | 42 |
| B | |
| 48.3 | 100 |

$B = C_6H_6O$* (134) Phenol

| A | |
|---|---|
| 31 | 0 |
| A + B | |
| 7.5E | 57 |
| B | |
| 40.8 | 100 |

$B = C_6H_6O_2$* (134) Resorcinol

| A | |
|---|---|
| 31 | 0 |
| A + B | |
| 30E | <1 |
| B | |
| 60 | 20 |
| 78.5 | 40 |
| 87.5 | 60 |
| 100.5 | 80 |
| 111 | 100 |

* Sandonnini, cooperating expert.

$B = C_6H_8ClN$* (134) Aniline hydrochloride

| °C | Mol % B |
|---|---|
| A | |
| 31 | 0 |
| A + AB | |
| 30E | <1 |
| AB | |
| 110.2 | 10 |
| 122.5 | 20 |
| 129.3 | 30 |
| AB + B | |
| 132U | 41 |
| B | |
| 157 | 50 |
| 166 | 58 |

$B = C_{10}H_8$ (133) Naphthalene

| A | |
|---|---|
| 31 | 0.0 |
| 28.7 | 4.5 |
| 25.7 | 8.0 |
| 23.8 | 10.9 |
| 20.6 | 15.5 |
| $A + A_2B$ | |
| 17E | 20 |
| $A_2B$ | |
| 18.8 | 24.9 |
| 19.2 | 27.0 |
| 19.5 | 30.0 |
| 19.6 | 32.0 |
| **19.7** | **33.3** |
| $A_2B + B$ | |
| 19.6E | 34.0 |
| B | |
| 21.6 | 35.0 |
| 28.0 | 40.3 |
| 33.6 | 45 |
| 39.9 | 50 |
| 50.6 | 60 |
| 59.4 | 70 |
| 67.4 | 80 |
| 73.9 | 90 |
| 80.0 | 100 |
| A | |
| 16.3m | 20.5 |
| 14.8m | 22.0 |
| 11.8m | 24.9 |
| A + B | |
| 9.6mE | 27.0 |
| B | |
| 14.4m | 30.0 |
| 16.0m | 30.7 |

$B = C_{10}H_8O$* (134) α-Naphthol

| A | |
|---|---|
| 31 | 0 |
| A + B | |
| 20.8E | 20 |
| B | |
| 96 | 100 |

* Sandonnini, cooperating expert.

### $SbCl_3$

$B = C_2H_4O_2$ (102) Acetic acid

| °C | Mol % A |
|---|---|
| B | |
| 16.5 | 0.0 |
| 15 | 1.9 |
| 10 | 7.1 |
| + 5 | 12.1 |
| 0 | 16.3 |
| − 5 | 20.0 |
| B + AB | |
| − 9 | 22.6 |
| AB | |
| − 5 | 24.8 |
| 0 | 27.8 |
| + 5 | 31.2 |
| 10 | 35.3 |
| 15 | 40.8 |
| 18 | 46.2 |
| **19** | **50.0** |
| 18m | 53.6 |
| 15m | 59.2 |
| AB + A | |
| 18.7E | 51.3 |
| A | |
| 5m | 46.5 |
| 15m | 50.0 |
| 25 | 53.9 |
| 35 | 58.8 |
| 45 | 64.3 |
| 55 | 73.0 |
| 65 | 84.0 |
| 70 | 92.5 |
| 73 | 100.0 |

$B = C_6H_4Br_2$ (100) *p*-Dibromobenzene

| B | |
|---|---|
| 88 | 0 |
| 85 | 5.9 |
| 80 | 15.8 |
| 75 | 25.7 |
| 70 | 35.7 |
| 65 | 45.4 |
| 60 | 53.8 |
| 55 | 57.9 |
| A + B | |
| 49.5E | 64.9 |
| A | |
| 55 | 72.5 |
| 60 | 79.8 |
| 65 | 87.1 |
| 70 | 95.2 |
| 73 | 100.0 |

$B = C_6H_4Br_3N$ (106) 2, 4, 6-Tribromoaniline

| B | |
|---|---|
| 119 | 0 |
| 110 | 19.6 |
| 100 | 33.7 |
| 90 | 44.6 |
| 71m | 57.9 |

$B = C_6H_4Br_3N$.—(*Continued*)

| °C | Mol % A |
|---|---|
| B + AB | |
| 80.5U | 51.6 |
| AB | |
| 80.5m | 48.41 |
| **81m** | **50.0** |
| 75 | 62.1 |
| 70 | 67.0 |
| 60 | 74.5 |
| A + AB | |
| 49E | 76.8 |
| A | |
| 55 | 82.2 |
| 60 | 87.1 |
| 65 | 91.9 |
| **70** | **97.0** |
| 73 | 100 |

$B = C_6H_4Cl_2$ (100) *p*-Dichlorobenzene

| B | |
|---|---|
| 54.5 | 0 |
| 50 | 6.3 |
| 45 | 15.5 |
| 40 | 28.8 |
| B + A | |
| 39.5E | 29.5 |
| A | |
| 45 | 37.5 |
| 50 | 46.4 |
| 55 | 56.0 |
| 60 | 66.5 |
| 65 | 78.1 |
| 70 | 91.1 |
| 73 | 100.0 |

$B = C_6H_4N_2O_4$ (100) *m*-Dinitrobenzene

| B | |
|---|---|
| 90 | 0 |
| 80 | 14.3 |
| 70 | 25.3 |
| 60 | 33.8 |
| 50 | 40.7 |
| 40 | 45.6 |
| 30 | 49.8 |
| B + AB | |
| 28.3E | 49.9 |
| AB | |
| **28.5** | **50.0** |
| 27.5 | 55.0 |
| 25.0 | 60.2 |
| AB + A | |
| 21.0E | 65.5 |
| A | |
| 30 | 68.8 |
| 40 | 73.2 |
| 50 | 78.5 |
| 60 | 85.8 |
| 70 | 95.2 |
| 73 | 100.0 |
| B | |
| 20m | 53.6 |
| +10m | 57.0 |

$B = C_6H_4N_2O_4$.—(*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| −11m | 62.2 |
| A + B | |
| + 1mE | 59.9 |
| A | |
| −10m | 57.7 |
| +10m | 62.4 |
| 20m | 65.2 |
| AB | |
| 20m | 66.2 |
| 15m | 70.2 |
| 10m | 73.5 |
| 5m | 76.0 |
| 0m | 78.1 |

$B = C_6H_5Br$ (100) Bromobenzene

| B | |
|---|---|
| −31 | 0 |
| −35m | 6.4 |
| B + AB | |
| −32.5E | 3.4 |
| AB | |
| −30 | 4.8 |
| −25 | 7.6 |
| −20 | 10.7 |
| −15 | 14.1 |
| −10 | 17.8 |
| − 5 | 21.7 |
| 0 | 26.6 |
| AB + A | |
| + 3U | 31.8 |
| AB | |
| 5m | 37.1 |
| 6m | 41.9 |
| 6.5m | 45.4 |
| **7.0m** | **50** |
| A | |
| 10 | 36.4 |
| 20 | 43.2 |
| 30 | 50.8 |
| 40 | 59.2 |
| 50 | 68.8 |
| 60 | 80.6 |
| 65 | 87.2 |
| 70 | 95.0 |
| 73 | 100.0 |

$B = C_6H_5Cl$ (100) Chlorobenzene

| B | |
|---|---|
| −45.2 | 0 |
| B + AB | |
| −47E | 2.2 |
| AB | |
| −40 | 3.6 |
| −30 | 6.0 |
| −20 | 9.0 |
| −15 | 11.6 |
| −10 | 14.4 |
| − 5 | 19.4 |
| + 4m | 41.4 |
| AB + A | |
| 0U | 28.1 |

$B = C_6H_5Cl$.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 10 | 32.5 |
| 20 | 38.7 |
| 30 | 47.1 |
| 40 | 56.2 |
| 50 | 66.6 |
| 60 | 78.7 |
| 70 | 94.3 |
| 73 | 100.0 |

$B = C_6H_5F$ (109) Fluorobenzene

| B | |
|---|---|
| −39.2 | 0 |
| B + AB | |
| −40.5E | 1.0 |
| AB | |
| −35 | 2.3 |
| −25 | 5.0 |
| −15 | 8.1 |
| −10 | 10.4 |
| − 5 | 13.2 |
| 0 | 18.1 |
| + 8m | 33.1 |
| **10m** | **50.0** |
| AB + A | |
| 5.5U | 26.5 |
| A | |
| 15 | 32.8 |
| 25 | 40.6 |
| 35 | 49.5 |
| 45 | 59.3 |
| 55 | 71.3 |
| 65 | 86.3 |
| 73 | 100.0 |

$B = C_6H_5I$ (100) Iodobenzene

| B | |
|---|---|
| −28.6 | 0 |
| −30.0 | 2.4 |
| B + AB | |
| −34.5E | 12 |
| AB | |
| −25 | 16.4 |
| −15 | 24.6 |
| − 5 | 39.1 |
| AB + A | |
| − 4U | 41.5 |
| A | |
| + 5 | 44.5 |
| 15 | 48.7 |
| 25 | 53.9 |
| 35 | 60.1 |
| 45 | 67.5 |
| 55 | 76.2 |
| 65 | 87.4 |
| 70 | 95.0 |
| 73 | 100.0 |
| B | |
| −40m | 22.2 |
| A + B | |
| −45mE | 28.4 |

**B = $C_6H_5I$.—** (*Continued*)

| °C | Mol % A |
|---|---|
| | A |
| −35m | 30.9 |
| −25m | 33.9 |
| −15m | 37.2 |
| − 5m | 40.7 |
| | AB |
| − 3m | 47.2 |

**B = $C_6H_5NO_2$ (100)** Nitrobenzene

| °C | Mol % A |
|---|---|
| | B |
| + 6 | 0 |
| + 2 | 7.0 |
| − 2 | 12.1 |
| − 6 | 16.5 |
| −10 | 20.3 |
| −14 | 23.5 |
| −18m | 26.2 |
| | B + AB |
| −16.5E | 25.2 |
| | AB |
| −13.5 | 27.3 |
| −10.5 | 29.8 |
| − 7.5 | 35.2 |
| − 6.5 | 40.7 |
| **− 6.0** | **50.0** |
| | AB + A |
| − 6.5E | 52.7 |
| | A |
| −15m | 50.2 |
| − 5 | 52.8 |
| + 5 | 55.8 |
| 15 | 59.2 |
| 25 | 63.0 |
| 35 | 67.6 |
| 45 | 72.8 |
| 55 | 79.0 |
| 65 | 87.2 |
| 70 | 92.7 |
| 73 | 100.0 |

**B = $C_6H_6$ (100)** B

| °C | Mol % A |
|---|---|
| 5.6 | 0 |
| 4 | 2.6 |
| | B + $A_2B$ |
| 1E | 7.1 |
| | $A_2B$ |
| 10 | 10.1 |
| 20 | 13.1 |
| 30 | 16.8 |
| 40 | 21.4 |
| 50 | 27.2 |
| 60 | 34.7 |
| 70 | 45.2 |
| 75 | 53.1 |
| 77.5 | 58.7 |
| **79** | **66.6** |
| 77.5 | 73.4 |
| 75 | 78.5 |
| 70 | 83.3 |
| | $A_2B$ + A |
| 62E | 89.3 |

**B = $C_6H_6$.—** (*Continued*)

| °C | Mol % A |
|---|---|
| | A |
| 67.5 | 94.2 |
| 73 | 100.0 |

**B = $C_6H_6BrN$ (106)** *p*-Bromoaniline

| | |
|---|---|
| | B |
| 63.5 | 0 |
| | B + $AB_3$ |
| 62E | 2.1 |
| | $AB_3$ |
| 81 | 5.4 |
| 91 | 8.9 |
| 95.5 | 11.5 |
| 103 | 18.7 |
| 105 | 23.5 |
| **105.5** | **25.0** |
| 105 | 27.3 |
| 102 | 32.9 |
| 96 | 38.2 |
| 90 | 41.6 |
| 73 | 46.0 |
| 68 | 49.8 |
| 57 | 52.0 |
| 49 | 54.4 |
| | A |
| 46 | 78.6 |
| 63 | 88.6 |
| 70 | 94.7 |
| 73 | 100 |

**B = $C_6H_6O$ (111)** Phenol

| | |
|---|---|
| | B |
| 41 | 0.0 |
| 35 | 7.4 |
| 30 | 12.5 |
| 25 | 17.0 |
| 20 | 20.8 |
| 15 | 24.3 |
| 10 | 27.5 |
| | B + $A_2B$ |
| 5E | 30.3 |
| | $A_2B$ |
| 10 | 33.6 |
| 15 | 36.9 |
| 20 | 40.5 |
| 25 | 44.7 |
| 30 | 50.2 |
| 35 | 58.7 |
| **37** | **66.6** |
| | $A_2B$ + A |
| 36.5E | 68.4 |
| | A |
| 45 | 73.5 |
| 55 | 80.0 |
| 60 | 83.6 |
| 65 | 89.4 |
| 70 | 95.7 |
| 73 | 100.0 |

**B = $C_6H_6O_3S$ (110)** Benzenesulfonic acid

**B = $C_6H_6O_3S$.—** (*Continued*)

| °C | Mol % A |
|---|---|
| | B |
| 52.5 | 0.0 |
| 45 | 13.1 |
| 35 | 25.1 |
| 25 | 35.1 |
| + 5m | 47.0 |
| − 5m | 51.6 |
| | B + A |
| +13E | 43.4 |
| | A |
| − 5m | 38.5 |
| + 5m | 41.2 |
| 25 | 47.6 |
| 35 | 53.1 |
| 45 | 61.0 |
| 55 | 71.8 |
| 65 | 87.0 |
| 70 | 94.5 |
| 73 | 100.0 |

**B = $C_6H_7N$ (112)** Aniline

| | |
|---|---|
| | B |
| − 6 | 0 |
| | B + $AB_4$ |
| − 7.2E | 0.5 |
| | $AB_6$ |
| 0m | 1.8 |
| + 7m | 3.5 |
| | $AB_4$ |
| 0 | 1.0 |
| 10 | 2.0 |
| 20 | 3.0 |
| 30 | 4.1 |
| 40 | 5.4 |
| 50 | 6.9 |
| 60 | 8.7 |
| 70 | 10.9 |
| 75 | 13.1 |
| | $AB_4$ + $AB_3$ |
| 77U | 14.7 |
| | $AB_3$ |
| 80 | 16.3 |
| 85 | 20.5 |
| **88** | **25.0** |
| | $AB_3$ + $AB_2$ |
| 87 | 26.2 |
| | $AB_2$ |
| 90 | 27.4 |
| 93 | 29.8 |
| **94.5** | **33.3** |
| 93 | 37.2 |
| | $AB_2$ + AB |
| 89.5 | 40.1 |
| | AB |
| 95 | 43.0 |
| 98 | 46.5 |
| **100.5** | **50.0** |
| 98 | 55.1 |
| 90 | 59.2 |
| 80 | 62.6 |
| 70 | 65.6 |
| 60 | 68.4 |
| 50 | 71.0 |
| 40 | 73.6 |

**B = $C_6H_7N$.—** (*Continued*)

| °C | Mol % A |
|---|---|
| | AB + A |
| 31E | 75.0 |
| | A |
| 40 | 78.6 |
| 50 | 83.2 |
| 60 | 89.1 |
| 70 | 96.5 |
| 73 | 100.0 |

**B = $C_6H_{10}$ (104)** Tetrahydrobenzene

| | |
|---|---|
| | A |
| −25 | 7.9 |
| −15 | 10.3 |
| − 5 | 13.3 |
| + 5 | 17.5 |
| 15 | 23.0 |
| 25 | 30.0 |
| 35 | 39.0 |
| 45 | 50.3 |
| 55 | 64.9 |
| 65 | 82.9 |
| 73 | 100.0 |

**B = $C_6H_{12}$ (104)** Cyclohexane

| | | |
|---|---|---|
| | B | |
| 6.4 | 0 | |
| | A + B | |
| 6.0E | 0.08 | |
| | A | |
| 20 | 0.4 | |
| 30 | 0.9 | |
| 40 | 1.6 | |
| 50 | 2.6 | |
| 60 | 3.8 | |
| Two liquid phases | | |
| 70 | 5.9 | 92.3 |
| 80 | 8.3 | 90.2 |
| 90 | 11.3 | 87.1 |
| 100 | 15.1 | 82.5 |
| 110 | 20.1 | 76.1 |
| 120 | 28.3 | 64.4 |
| 124 | 34.7 | 54.7 |
| 125.5crit. | 44.1 | |
| | A | |
| 73 | 100.0 | |

**B = $C_7H_5ClO$ (102)** Benzoyl chloride

| | |
|---|---|
| | B |
| − 0.5 | 0.0 |
| − 5 | 11.8 |
| −10 | 20.1 |
| −15 | 26.6 |
| | B + A |
| −23E | 33.3 |
| | A |
| −15 | 35.7 |
| − 5 | 38.6 |
| + 5 | 42.1 |
| 15 | 46.3 |
| 25 | 51.4 |
| 35 | 57.7 |
| 45 | 65.5 |
| 55 | 74.7 |

**B = $C_7H_5ClO$.—** (*Continued*)

| °C | Mol % A |
|---|---|
| | A |
| 65 | 86.6 |
| 70 | 94.6 |
| 73 | 100.0 |

**B = $C_7H_5N$ (105)** Benzonitrile

| | |
|---|---|
| | B |
| −13.2 | 0 |
| −16.0 | 4.9 |
| −25.0m | 12.6 |
| | B + AB |
| −19 .0E | 8.6 |
| | AB |
| −10 | 11.2 |
| 0 | 15.2 |
| + 5 | 18.1 |
| 10 | 22.2 |
| 15 | 29.1 |
| 20 | 43.1 |
| **21. 5** | **50. 0** |
| 20.0 | 54.1 |
| | AB + A |
| 15E | 63.3 |
| | A |
| 25 | 67.0 |
| 35 | 71.0 |
| 45 | 75.8 |
| 55 | 82.3 |
| 65 | 91.7 |
| 70 | 96.4 |
| 73 | 100.0 |

**B = $C_7H_6O$ (105)** Benzaldehyde

| | |
|---|---|
| | AB |
| 10 | 26.3 |
| 20 | 29.5 |
| 30 | 34.0 |
| 35 | 37.0 |
| 40 | 41.5 |
| 42 | 44.5 |
| **43. 5** | **50. 0** |
| 42 | 54.8 |
| 40 | 57.9 |
| 35 | 62.2 |
| 30 | 65.9 |
| | AB + A |
| +25E | 69.1 |
| | A |
| − 5m | 63.7 |
| + 5m | 65.1 |
| 15m | 66.9 |
| 35 | 72.1 |
| 45 | 76.3 |
| 55 | 81.8 |
| 65 | 89.3 |
| 70 | 96.2 |
| 73 | 100.0 |

**B = $C_7H_6O_2$ (102)** Benzoic acid

| | |
|---|---|
| | B |
| 120 | 0 |
| 110 | 14.1 |
| 100 | 25.5 |

**B = $C_7H_6O_2$.—** (*Continued*)

| °C | Mol % A |
|---|---|
| | B |
| 90 | 35.0 |
| 80 | 43.4 |
| 70 | 50.8 |
| 60 | 57.5 |
| | B + A |
| 46E | 65.6 |
| | A |
| 50 | 71.0 |
| 60 | 82.0 |
| 70 | 93.3 |
| 73 | 100.0 |

**B = $C_7H_7Cl$ (107)** *o*-Chlorotoluene

| | |
|---|---|
| | B |
| −36.2 | 0.0 |
| | B + AB |
| −37.5E | 4.0 |
| | AB |
| −30 | 6.4 |
| −20 | 10.8 |
| −10 | 18.5 |
| − 5 | 24.9 |
| + 2m | 44.0 |
| **3m** | **50.0** |
| + 2m | 53.7 |
| | AB + A |
| − 0.5U | 34.1 |
| | A |
| +10 | 39.1 |
| 20 | 44.2 |
| 30 | 50.4 |
| 40 | 58.6 |
| 50 | 69.0 |
| 60 | 81.0 |
| 70 | 95.3 |
| 73 | 100.0 |

**B = $C_7H_7Cl$ (107)** *m*-Chlorotoluene

| | |
|---|---|
| | B |
| −47.2 | 0.0 |
| | B + AB |
| −49E | 4.0 |
| | AB |
| −40 | 7.2 |
| −30 | 12.3 |
| −20 | 20.2 |
| −10m | 37.1 |
| − 9m | 41.2 |
| | AB + A |
| −14U | 27.2 |
| | A |
| 0 | 32.5 |
| +10 | 37.3 |
| 20 | 43.4 |
| 30 | 51.0 |
| 40 | 59.5 |
| 50 | 69.2 |
| 60 | 81.4 |
| 70 | 95.7 |
| 73 | 100.0 |

$SbCl_3$.—(*Cont'd*)

B = $C_7H_7Cl$ (107)

*p*-Chlorotoluene

| °C | Mol % A |
|---|---|
| B | |
| 6.2 | 0 |
| + 3 | 7.4 |
| 0 | 14.4 |
| − 3 | 20.8 |
| − 6 | 26.6 |
| B + A | |
| − 7.5E | 30.2 |
| A | |
| 0 | 33.3 |
| +10 | 37.8 |
| 20 | 43.7 |
| 30 | 50.6 |
| 40 | 58.9 |
| 50 | 69.7 |
| 60 | 81.3 |
| 70 | 95.7 |
| 73 | 100.0 |

B = $C_7H_7NO_2$ (107)

*o*-Nitrotoluene

| B | |
|---|---|
| − 8.5 | 0 |
| −13.5 | 7.1 |
| B + AB | |
| −18.5E | 12.0 |
| AB | |
| −10 | 14.0 |
| 0 | 17.3 |
| +10 | 21.2 |
| 20 | 27.7 |
| 25 | 32.3 |
| 30 | 38.3 |
| 33 | 43.1 |
| **34.5** | **50.0** |
| 33 | 56.2 |
| 30 | 61.3 |
| AB + A | |
| 27.5E | 63.9 |
| A | |
| 10m | 58.8 |
| 20m | 61.5 |
| 30 | 65.3 |
| 40 | 69.8 |
| 50 | 76.1 |
| 60 | 85.1 |
| 70 | 95.6 |
| 73 | 100.0 |

B = $C_7H_7NO_2$ (107)

*m*-Nitrotoluene

| B | |
|---|---|
| 16 | 0 |
| +10 | 10.0 |
| 0 | 20.9 |
| −10 | 27.8 |
| −20 | 31.3 |
| vis. | 32–55 |
| A | |
| 0 | 55.2 |
| +20 | 61.5 |
| 30 | 66.2 |
| 40 | 71.3 |

B = $C_7H_7NO_2$.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 50 | 77.8 |
| 60 | 86.0 |
| 70 | 96.1 |
| 73 | 100.0 |

B = $C_7H_7NO_2$ (107)

*p*-Nitrotoluene

| B | |
|---|---|
| 52.5 | 0.0 |
| 50 | 4.4 |
| 45 | 12.0 |
| 40 | 18.2 |
| 35 | 22.9 |
| 30 | 27.3 |
| 20 | 33.3 |
| +10 | 37.9 |
| 0m | 41.7 |
| −10m | 44.7 |
| B + AB | |
| + 7.5E | 39.3 |
| AB | |
| **7.5** | **50.0** |
| 5 | 54.0 |
| AB + A | |
| + 3E | 57.1 |
| A | |
| −20m | 52.0 |
| 0m | 56.4 |
| +10 | 58.8 |
| 20 | 61.6 |
| 30 | 65.3 |
| 40 | 70.7 |
| 50 | 76.8 |
| 60 | 85.1 |
| 70 | 95.6 |
| 73 | 100.0 |

B = $C_7H_8$ (95)

Toluene

| B | |
|---|---|
| −93 | 0 |
| B + AB | |
| −94E | 0.5 |
| AB | |
| −80 | 0.9 |
| −70 | 1.4 |
| −60 | 2.1 |
| −50 | 3.3 |
| −40 | 5.1 |
| −30 | 7.2 |
| −20 | 10.0 |
| −10 | 14.4 |
| 0 | 22.1 |
| + 6 | 28.6 |
| AB + $A_2B$ | |
| 11U | 35.7 |
| $A_2B$ | |
| − 8m | 27.0 |
| + 1m | 31.0 |
| 20 | 40.5 |
| 30 | 47.6 |
| 35 | 52.6 |
| 40 | 59.3 |

B = $C_7H_8$.—(*Cont'd*)

| °C | Mol % A |
|---|---|
| $A_2B$ | |
| 41.5 | 61.4 |
| **42.5** | **66.6** |
| 41.5 | 69.4 |
| $A_2B$ + A | |
| 40.0E | 71.1 |
| A | |
| 50.0 | 77.7 |
| 60.0 | 83.8 |
| 70.0 | 94.7 |
| 73.0 | 100.0 |

B = $C_7H_8O$ (111)

Methyl phenyl ether

| B | |
|---|---|
| −34 | 0 |
| B + AB | |
| −36.5E | 6.1 |
| AB | |
| −30 | 8.3 |
| −20 | 11.8 |
| −10 | 15.8 |
| 0 | 20.5 |
| +10 | 26.4 |
| 20 | 34.8 |
| 23 | 39.1 |
| AB + $A_2B$ | |
| 25U | 45.1 |
| $A_2B$ | |
| 30 | 47.8 |
| 35 | 52.4 |
| 40 | 59.9 |
| **41.5** | **66.6** |
| 38.5m | 73.1 |
| $A_2B$ + A | |
| 40E | 72.7 |
| A | |
| 10m | 62.1 |
| 20m | 64.8 |
| 30m | 68.0 |
| 50 | 78.2 |
| 60 | 84.6 |
| 65 | 88.9 |
| 70 | 96 1 |
| 73 | 100.0 |

B = $C_8H_8O$ (102)

Acetophenone

| B | |
|---|---|
| 19.5 | 0.0 |
| 15 | 8.1 |
| 10 | 13.7 |
| 5 | 17.8 |
| B + AB | |
| 1E | 19.8 |
| AB | |
| 5 | 20.1 |
| 15 | 22.5 |
| 25 | 24.6 |
| 35 | 27.1 |
| 45 | 31.7 |
| 50 | 35.3 |
| 55 | 39.5 |
| 60 | 46.8 |

B = $C_8H_8O$.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB | |
| **60.5** | **50.0** |
| 60 | 53.4 |
| 55 | 59.7 |
| 50 | 63.7 |
| 45 | 67.0 |
| AB + A | |
| 32E | 73.5 |
| A | |
| −20m | 60.2 |
| 0m | 64.0 |
| +20m | 69.5 |
| 30m | 73.1 |
| 40 | 77.2 |
| 50 | 82.5 |
| 60 | 88.5 |
| 70 | 96.7 |
| 73 | 100.0 |

B = $C_8H_{10}$ (95)

Ethylbenzene

| B + AB | |
|---|---|
| −93E | 0.1 |
| AB | |
| −70 | 0.3 |
| −50 | 0.6 |
| −30 | 1.1 |
| −20 | 2.1 |
| −10 | 3.6 |
| 0 | 5.6 |
| +10 | 9.4 |
| 15 | 12.8 |
| 20 | 16.8 |
| 25 | 21.0 |
| 30 | 27.2 |
| 35 | 36.4 |
| 37 | 41.9 |
| **39** | **50** |
| 37 | 57.7 |
| AB + $A_2B$ | |
| 35E | 61.6 |
| $A_2B$ | |
| 36 | 63.0 |
| **37** | **66.6** |
| $A_2B$ + A | |
| 36.8E | 68.1 |
| A | |
| 40 | 70.3 |
| 50 | 77.3 |
| 60 | 85.5 |
| 65 | 90.3 |
| 70 | 95.6 |
| 73 | 100.0 |
| $A_2B$ | |
| 15m | 37.8 |
| 25m | 47.5 |
| 30m | 53.0 |
| AB + A | |
| 33mE | 65.7 |

B = $C_8H_{10}$ (101)

*o*-Xylene

| B | |
|---|---|
| −29 | 0 |
| −32 | 4.4 |

B = $C_8H_{10}$.—(*Continued*)

| °C | Mol % A |
|---|---|
| B + AB | |
| −35E | 7.1 |
| AB | |
| −30 | 9.0 |
| −20 | 13.4 |
| −10 | 18.7 |
| 0 | 26.4 |
| +10 | 36.4 |
| $A_2B$ + AB | |
| 19.5U | 50.0 |
| $A_2B$ | |
| 8 | 43.0 |
| 25 | 53.7 |
| 30 | 59.0 |
| 32.5 | 63.0 |
| **33.5** | **66.6** |
| 32.5 | 68.0 |
| $A_2B$ + A | |
| 31.5E | 69.0 |
| A | |
| 40 | 73.0 |
| 50 | 78.6 |
| 55 | 82.0 |
| 60 | 85.4 |
| 65 | 89.1 |
| 68 | 92.6 |
| 71 | 96.6 |
| 73 | 100.0 |

B = $C_8H_{10}$ (101)

*m*-Xylene

| B | |
|---|---|
| −57 | 0 |
| B + AB | |
| −60.5E | 3.6 |
| AB | |
| −55 | 5.0 |
| −45 | 8.2 |
| −35 | 12.2 |
| −25 | 16.5 |
| −15 | 21.5 |
| − 5 | 29.1 |
| AB + $A_2B$ | |
| − 4U | 31 |
| $A_2B$ | |
| + 5 | 34.6 |
| 15 | 40.0 |
| 25 | 47.2 |
| 30 | 52.6 |
| 33 | 56.8 |
| 36 | 61.9 |
| **38** | **66.6** |
| $A_2B$ + A | |
| 36.5E | 70.6 |
| A | |
| 40 | 72.1 |
| 50 | 76.9 |
| 55 | 79.8 |
| 60 | 83.5 |
| 65 | 87.9 |
| 68 | 91.4 |
| 70 | 94.3 |
| 72 | 98.0 |
| 73 | 100.0 |

B = $C_8H_{10}$.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB | |
| 5m | 42.2 |
| + **7.5m** | **50.0** |
| $A_2B$ | |
| −15m | 27.2 |
| − 5m | 30.6 |
| A | |
| +19m | 64.3 |
| 30m | 68.0 |

B = $C_8H_{10}$ (101)

*p*-Xylene

| B | |
|---|---|
| 14 | 0 |
| B + AB | |
| 11.7E | 5.6 |
| AB | |
| 20 | 9.0 |
| 30 | 14.4 |
| 35 | 17.8 |
| 40 | 21.8 |
| 45 | 27.0 |
| 50 | 34.0 |
| AB + $A_2B$ | |
| 55U | 43.1 |
| $A_2B$ | |
| 60 | 47.9 |
| 65 | 53.1 |
| 67.5 | 57.9 |
| **70** | **66.6** |
| 67.5 | 73.5 |
| 65 | 78.0 |
| 61.5 | 81.5 |
| $A_2B$ + A | |
| 58E | 84.4 |
| A | |
| 61.5 | 86.7 |
| 65 | 90.0 |
| 69 | 94.3 |
| 73 | 100.0 |
| B | |
| 10m | 11.2 |
| B + $A_2B$ | |
| 7m | 18.6 |
| $A_2B$ | |
| 15m | 22.1 |
| 25m | 27.1 |
| 35m | 32.2 |
| 45m | 37.5 |
| AB | |
| **56m** | **50** |

B = $C_8H_{10}O$ (111)

Phenetole

| B | |
|---|---|
| −28.6 | 0 |
| B + AB | |
| −29E | 0.7 |
| AB | |
| −20 | 2.5 |
| −10 | 4.5 |
| 0 | 7.1 |
| +10 | 10.7 |
| 20 | 16.7 |

**B = $C_8H_{10}O$.—** (*Continued*)

| °C | Mol % A |
|---|---|
| AB | |
| 25 | 20.7 |
| 30 | 26.2 |
| 35 | 33.0 |
| 40 | 42.7 |
| **42.2** | **50.0** |
| 40 | 54.8 |
| 35 | 64.8 |
| 30m | 71.6 |
| 26m | 75.2 |
| AB + A | |
| 33E | 67.5 |
| A | |
| 30m | 66.0 |
| 40 | 71.6 |
| 50 | 78.2 |
| 60 | 85.9 |
| 65 | 90.5 |
| 70 | 95.3 |
| 73 | 100.0 |

**B = $C_9H_{12}$ (101)** Mesitylene

| °C | Mol % A |
|---|---|
| B | |
| −54.4 | 0 |
| B + AB | |
| −55.6E | 0.8 |
| AB | |
| −40 | 1.6 |
| −30 | 2.6 |
| −20 | 3.9 |
| −10 | 5.4 |
| 0 | 7.8 |
| +10 | 12.2 |
| 20 | 17.8 |
| 30 | 25.8 |
| 35 | 31.4 |
| AB + $A_2B$ | |
| 38U | 35.9 |
| $A_2B$ | |
| 45 | 38.5 |
| 55 | 43.3 |
| 65 | 50.0 |
| 70 | 55.2 |
| 73 | 59.4 |
| **75.5** | **66.6** |
| 73 | 73.1 |
| 70 | 78.1 |
| 65 | 82.1 |
| $A_2B$ + A | |
| 58.5E | 87.1 |
| A | |
| 63 | 89.2 |
| 68 | 93.9 |
| 70 | 96.2 |
| 73 | 100.0 |

**B = $C_9H_{12}$ (95)** *n*-Propylbenzene

| °C | Mol % A |
|---|---|
| $A_2B$ | |
| −70 | 0.2 |
| −60 | 0.7 |
| −50 | 1.5 |
| −40 | 3.0 |
| −30 | 5.5 |

**B = $C_9H_{12}$.—** (*Continued*)

| °C | Mol % A |
|---|---|
| $A_2B$ | |
| −20 | 9.7 |
| −15 | 12.7 |
| −10 | 16.2 |
| − 5 | 20.5 |
| 0 | 26.2 |
| + 5 | 35.6 |
| 7 | 41.6 |
| $A_2B$ + A | |
| 8.5E | 53.2 |
| A | |
| 10 | 53.6 |
| 20 | 56.4 |
| 30 | 60.6 |
| 40 | 65.5 |
| 50 | 72.0 |
| 60 | 81.0 |
| 65 | 86.8 |
| 70 | 95.1 |
| 73 | 100.0 |
| AB | |
| −70m | 0.6 |
| −60m | 1.3 |
| −50m | 2.8 |
| −40m | 5.2 |
| −30m | 8.8 |
| −20m | 14.8 |
| −15m | 19.0 |
| −10m | 25.1 |
| − 5m | 32.4 |
| 0m | 43.3 |
| + **1.5m** | **50.0** |
| AB + A | |
| 1.0mE | 51.1 |
| A | |
| 0m | 51.0 |

**B = $C_9H_{12}$ (101)** Pseudocumene

| °C | Mol % A |
|---|---|
| B | |
| −57.4 | 0 |
| −58.5 | 6.3 |
| B + AB | |
| −60.0E | 10.8 |
| AB | |
| −45.0 | 14.1 |
| −35.0 | 17.0 |
| −25 | 20.9 |
| −15 | 26.3 |
| −10 | 30.3 |
| − 1m | 41.8 |
| **0m** | **50** |
| AB + $A_2B$ | |
| − 5U | 35.3 |
| $A_2B$ | |
| −15m | 33.1 |
| + 5 | 37.5 |
| 15 | 40.0 |
| 25 | 42.9 |
| 35 | 46.6 |
| 45 | 51.8 |
| 50 | 55.2 |
| 55 | 61.8 |
| **56** | **66.6** |
| 55 | 71.4 |

**B = $C_9H_{12}$.—** (*Continued*)

| °C | Mol % A |
|---|---|
| $A_2B$ + A | |
| 51E | 78.8 |
| A | |
| 55 | 81.3 |
| 60 | 84.4 |
| 65 | 89.1 |
| 70 | 95.4 |
| 73 | 100.0 |

**B = $C_{10}H_7Br$ (108)** *α*-Bromonaphthalene

| °C | Mol % A |
|---|---|
| B | |
| + 3 | 0.0 |
| B + AB | |
| − 1E | 7.6 |
| AB | |
| +10 | 12.0 |
| 15 | 14.7 |
| 20 | 17.7 |
| 25 | 22.4 |
| 30 | 28.6 |
| 33 | 36.7 |
| **34.5** | **50.0** |
| 33 | 60.0 |
| AB + A | |
| 31.5E | 63.5 |
| A | |
| 40 | 68.3 |
| 50 | 75.2 |
| 55 | 79.4 |
| 60 | 83.8 |
| 65 | 88.6 |
| 70 | 94.5 |
| 73 | 100.0 |

**B = $C_{10}H_7Cl$ (108)** *α*-Chloronaphthalene

| °C | Mol % A |
|---|---|
| B | |
| −17 | 0.0 |
| B + $A_2B$ | |
| −21E | 6.0 |
| $A_2B$ | |
| −10 | 8.6 |
| 0 | 11.3 |
| +10 | 14.5 |
| 20 | 18.8 |
| 25 | 21.8 |
| 30 | 26.2 |
| 35 | 31.9 |
| 40 | 39.8 |
| 42.5 | 45.4 |
| 45 | 53.2 |
| 46 | 60.0 |
| **46** | **66.6** |
| $A_2B$ + A | |
| >46E | 68.3 |
| A | |
| 50 | 72.1 |
| 55 | 77.2 |
| 60 | 82.3 |
| 65 | 88.4 |
| 70 | 95.3 |
| 73 | 100.0 |

**B = $C_{10}H_7Cl$ (108)** *β*-Chloronaphthalene

| °C | Mol % A |
|---|---|
| B | |
| 56 | 0 |
| 50 | 12.1 |
| 45 | 20.7 |
| 40 | 28.0 |
| 35 | 33.8 |
| 30 | 39.3 |
| 20m | 48.5 |
| 16.5m | 50.9 |
| B + AB | |
| 25E | 44.3 |
| AB | |
| 28.5 | 47.6 |
| **29.5** | **50.0** |
| 29.0 | 53.1 |
| AB + A | |
| 28.0E | 56.0 |
| A | |
| 16.5m | 50.9 |
| 20.0m | 52.2 |
| 25 | 54.5 |
| 30 | 57.4 |
| 35 | 60.8 |
| 40 | 64.7 |
| 45 | 69.0 |
| 50 | 73.6 |
| 55 | 78.4 |
| 60 | 83.5 |
| 65 | 89.2 |
| 70 | 95.7 |
| 73 | 100.0 |

**B = $C_{10}H_7NO_2$** *α*-Nitronaphthalene (108)

| °C | Mol % A |
|---|---|
| B | |
| 57 | 0.0 |
| 50 | 10.7 |
| 45 | 17.5 |
| 40 | 22.9 |
| 35 | 27.1 |
| 25m | 33.0 |
| B + AB | |
| 30E | 30.4 |
| AB | |
| 35 | 37.2 |
| 37.5 | 43.4 |
| **39.0** | **50.0** |
| 37.5 | 58.3 |
| AB + A | |
| 34.5E | 66.8 |
| A | |
| 30.0 | 64.7 |
| 40.0 | 69.8 |
| 45.0 | 73.0 |
| 50.0 | 76.5 |
| 55.0 | 80.2 |
| 60.0 | 84.4 |
| 65.0 | 89.4 |
| 70.0 | 95.6 |
| 73.0 | 100.0 |

**B = $C_{10}H_8$ (108)** Naphthalene

| °C | Mol % A |
|---|---|
| B | |
| 79.4 | 0.0 |
| 75 | 9.2 |
| 70 | 17.1 |
| 65 | 23.7 |
| B + $A_2B$ | |
| 59E | 29.9 |
| $A_2B$ | |
| 65 | 34.4 |
| 70 | 39.0 |
| 75 | 44.8 |
| 80 | 51.3 |
| 85 | 61.9 |
| **86** | **66.6** |
| 85 | 73.0 |
| 80 | 80.0 |
| 75 | 85.0 |
| 70 | 88.3 |
| $A_2B$ + A | |
| 65E | 90.0 |
| A | |
| 70 | 95.4 |
| 73 | 100.0 |

**B = $C_{10}H_{14}$ (101)** *p*-Cymene

| °C | Mol % A |
|---|---|
| B | |
| −75 | 0 |
| B + AB | |
| −76.5E | 1.2 |
| AB | |
| −60 | 2.9 |
| −50 | 4.6 |
| −40 | 6.7 |
| −30 | 9.3 |
| −20 | 13.6 |
| −10 | 20.5 |
| − 5 | 25.5 |
| AB + $A_2B$ | |
| − 3.5U | 29.2 |
| $A_2B$ | |
| +10 | 33.8 |
| 20 | 39.0 |
| 30 | 47.3 |
| 35 | 53.2 |
| $A_2B$ + A | |
| 40U | 65.7 |
| A | |
| 0m | 50.9 |
| 10m | 53.9 |
| 20m | 57.2 |
| 30m | 61.0 |
| 50 | 71.7 |
| 60 | 80.0 |
| 65 | 85.3 |
| 70 | 93.8 |
| 73 | 100.0 |

**B = $C_{11}H_{16}$** (95) Amylbenzene

| °C | Mol % A |
|---|---|
| AB | |
| −80 | 3.0 |
| −70 | 5.4 |

**B = $C_{11}H_{16}$.—** (*Continued*)

| °C | Mol % A |
|---|---|
| AB | |
| −60 | 8.4 |
| −50 | 12.4 |
| −40 | 17.9 |
| AB + $A_2B$ | |
| −35E | 22.5 |
| $A_2B$ | |
| −25 | 29.3 |
| −15 | 36.6 |
| $A_2B$ + A | |
| − 5E | 45.6 |
| A | |
| 0 | 46.3 |
| +10 | 48.8 |
| 20 | 52.5 |
| 30 | 57.3 |
| 40 | 63.4 |
| 50 | 71.4 |
| 60 | 81.7 |
| 65 | 88.0 |
| 70 | 95.5 |
| 73 | 100.0 |
| AB | |
| −30m | 27.3 |
| −25m | 34.4 |
| −22m | 40.7 |
| **−20.5m** | **50.0** |
| −22m | 54.0 |
| $A_2B$ | |
| −45m | 17.1 |
| −35m | 22.8 |
| 0m | 52.3 |
| + 5m | 60.3 |
| **7.5m** | **66.6** |
| AB + A | |
| −21mE | 44.2 |
| A | |
| −10m | 44.9 |

**B = $C_{12}H_{10}$ (103)** Diphenyl

| °C | Mol % A |
|---|---|
| B | |
| 70.5 | 0.0 |
| 65 | 10.0 |
| 60 | 18.8 |
| 55 | 25.5 |
| B + $A_2B$ | |
| 50E | 31.1 |
| $A_2B$ | |
| 55 | 36.0 |
| 60 | 41.8 |
| 65 | 49.4 |
| 70 | 62.0 |
| **71** | **66.6** |
| 70 | 71.1 |
| 65 | 80.2 |
| $A_2B$ + A | |
| 57E | 84.4 |
| A | |
| 65 | 89.7 |
| 70 | 95.1 |
| 73 | 100.0 |

## $SbCl_3$.—(*Cont'd*)

B = $C_{12}H_{10}N_2$ (154)
Azobenzene

| °C | Mol % A |
|---|---|
| A | |
| 73.0 | 100.0 |
| A + $A_4B$ | |
| 65.6E | 95.0 |
| $A_4B$ | |
| 71.8 | 92.0 |
| 74.2 | 89.93 |
| 79.5 | 85.00 |
| 80.0 | 83.63 |
| **80.7** | **80.00** |
| 78.3 | 75.01 |
| 76.1 | 69.67 |
| 65.4 | 59.97 |
| 59.2 | 50.16 |
| $A_4B$ + B | |
| 50.5E | 40.09 |
| B | |
| 54.8 | 29.93 |
| 59.2 | 19.94 |
| 63.1 | 9.98 |
| 68.0 | 0.0 |

B = $C_{13}H_{10}O$ (102)
Benzophenone

| | |
|---|---|
| B | |
| 48 | 0.0 |
| 45 | 6.3 |
| 40 | 13.4 |
| B + AB | |
| 35E | 17.7 |
| AB | |
| 45 | 22.0 |
| 55 | 26.7 |
| 65 | 32.5 |
| 70 | 37.1 |
| 75 | 46.1 |
| **76** | **50.0** |
| 75 | 53.5 |
| 70 | 62.3 |
| 65 | 66.8 |
| 55 | 72.3 |
| 45 | 76.6 |
| AB + A | |
| 39E | 79.3 |
| A | |
| 10m | 69.5 |
| 20m | 72.2 |
| 30m | 75.8 |
| 40 | 80.1 |
| 50 | 84.6 |
| 60 | 89.6 |
| 70 | 96.8 |
| 73 | 100.0 |

B = $C_{13}H_{12}$ (103)
Diphenylmethane

| | |
|---|---|
| B | |
| 26 | 0 |
| B + $A_2B$ | |
| 22.5E | 6.0 |
| $A_2B$ | |
| 30 | 7.7 |
| 40 | 11.3 |

B = $C_{13}H_{12}$.—(*Continued*)

| °C | Mol % A |
|---|---|
| $A_2B$ | |
| 50 | 15.7 |
| 60 | 20.6 |
| 70 | 27.3 |
| 80 | 35.2 |
| 85 | 40.0 |
| 90 | 45.6 |
| 95 | 52.6 |
| 98 | 59.1 |
| **100** | **66.6** |
| 98 | 72.6 |
| 95 | 77.4 |
| 90 | 83.0 |
| 85 | 86.4 |
| 80 | 89.0 |
| 75 | 91.2 |
| $A_2B$ + A | |
| 67E | 94.3 |
| A | |
| 70 | 97.0 |
| 73 | 100.0 |

B = $C_{14}H_{10}O_2$ (154)
Benzil

| | |
|---|---|
| A | |
| 73.0 | 100.0 |
| 68.5 | 96.45 |
| 61.0 | 90.47 |
| 51.0 | 84.62 |
| 37.0 | 78.24 |
| ? | |
| vis. | 75–50 |
| B | |
| 31.0 | 48.26 |
| 54.0 | 40.0 |
| 69.4 | 30.59 |
| 84.0 | 16.81 |
| 94.0 | 0.0 |

B = $C_{14}H_{12}$ (154)
Stilbene

| | |
|---|---|
| A | |
| 73.0 | 100.0 |
| 65.2 | 90.0 |
| A + $A_2B$ | |
| 46.4E | 80.0 |
| $A_2B$ | |
| 83.6 | 75.0 |
| 96.3 | 70.0 |
| 97.3 | 67.98 |
| **97.3** | **66.6** |
| 88.5 | 60.00 |
| 83.8 | 58.58 |
| $A_2B$ + B | |
| 75.5E | |
| B | |
| 80.7 | 50.00 |
| 100.5 | 32.46 |
| 125.0 | 0.0 |

B = $C_{14}H_{14}$ (154)
Dibenzyl

| | |
|---|---|
| A | |
| 73.0 | 100.0 |
| 71.2 | 98.14 |
| 68.1 | 95 03 |

B = $C_{14}H_{14}$.—(*Continued*)

| °C | Mol % A |
|---|---|
| A + $A_4B$ | |
| 66.4E | |
| $A_4B$ | |
| 69.4 | 91.10 |
| 74.6 | 86.11 |
| 76.5 | 83.60 |
| 77.3 | 80.96 |
| 77.2 | 78.71 |
| 75.9 | 74.00 |
| $A_4B$ + $A_2B$ | |
| 74.2E | 73.83 |
| $A_2B$ | |
| 74.7 | 71.25 |
| 76.0 | 67.01 |
| 75.6 | 65.90 |
| 72.9 | 57.45 |
| 71.4 | 53.70 |
| 66.4 | 47.12 |
| 59.7 | 38.29 |
| 51.8 | 32.10 |
| $A_2B$ + B | |
| 43.3E | 23.85 |
| B | |
| 48.9 | 9.66 |
| 51.5 | 0.0 |

B = $C_{19}H_{16}$ (103)
Triphenylmethane

| | |
|---|---|
| B | |
| 92 | 0.0 |
| 85 | 12.9 |
| 80 | 20.5 |
| 70 | 33.5 |
| 60 | 44.1 |
| 50 | 51.5 |
| 42m | 56.0 |
| AB | |
| 48.5m | 45.2 |
| **49.5m** | **50.0** |
| B + AB | |
| 49.3U | 52.0 |
| AB | |
| 48.5 | 56.4 |
| 45.0 | 64.6 |
| 40.0 | 70.0 |
| AB + A | |
| 35E | 73.6 |
| A | |
| 45 | 77.9 |
| 55 | 83.4 |
| 65 | 91.1 |
| 70 | 96.4 |
| 73 | 100.0 |

## $SbBr_3$

B = $C_2H_4O_2$ (102)
Acetic acid

| | |
|---|---|
| B | |
| 16.5 | 0.0 |
| 15.0 | 2.3 |
| 10 | 10.2 |
| B + A | |
| 4E | 18.5 |

B = $C_2H_4O_2$.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 10 | 20.2 |
| 20 | 23.1 |
| 30 | 26.2 |
| 40 | 30.5 |
| 50 | 35.7 |
| 60 | 43.0 |
| 70 | 52.6 |
| 80 | 69.4 |
| 90 | 90.0 |
| 94 | 100.0 |

B = $C_6H_4Cl_2$ (100)
*p*-Dichlorobenzene

| | |
|---|---|
| B | |
| 54.5 | 0 |
| 51.5 | 6.3 |
| B + A | |
| 48.5E | 12.8 |
| A | |
| 55 | 18.7 |
| 60 | 23.5 |
| 65 | 29.5 |
| 70 | 37.0 |
| 75 | 45.6 |
| 80 | 56.2 |
| 85 | 68.9 |
| 90 | 85.2 |
| 94 | 100.0 |

B = $C_6H_4Br_2$ (100)
*p*-Dibromobenzene

| | |
|---|---|
| B | |
| 88 | 0 |
| 85 | 6.8 |
| 80 | 18.0 |
| 75 | 29.5 |
| 70 | 41.5 |
| B + A | |
| 65E | 52.0 |
| A | |
| 70 | 59.1 |
| 75 | 66.5 |
| 80 | 74.4 |
| 85 | 83.0 |
| 90 | 91.8 |
| 92 | 95.4 |
| 94 | 100.0 |

B = $C_6H_4Br_3N$
2, 4, 6-Tribromoaniline (106)

| | |
|---|---|
| B | |
| 119 | 0 |
| 110 | 19.1 |
| 100 | 34.2 |
| 90 | 46.9 |
| 80 | 57.4 |
| 70 | 65.2 |
| B + A | |
| 62 | 69.9 |
| A | |
| 70 | 75.7 |
| 80 | 83.4 |
| 85 | 87.7 |
| 90 | 93.2 |
| 94 | 100.0 |

B = $C_6H_4N_2O_4$ (100)
*m*-Dinitrobenzene

| °C | Mol % A |
|---|---|
| B | |
| 90 | 0 |
| 85 | 8.1 |
| 80 | 16.2 |
| 75 | 24.2 |
| 70 | 31.8 |
| 65 | 38.5 |
| 60 | 44.3 |
| 55 | 49.1 |
| 50 | 53.0 |
| B + A | |
| 47.5E | 54.4 |
| A | |
| 50 | 56.1 |
| 55 | 58.8 |
| 60 | 62.2 |
| 65 | 66.2 |
| 70 | 70.8 |
| 75 | 76.0 |
| 80 | 81.7 |
| 85 | 87.8 |
| 90 | 94.2 |
| 94 | 100.0 |

B = $C_6H_5Br$ (100)
Bromobenzene

| | |
|---|---|
| B | |
| −31 | 0 |
| B + A | |
| − 32E | 2.6 |
| A | |
| − 25 | 4.4 |
| − 15 | 6.9 |
| − 5 | 9.9 |
| + 5 | 13.4 |
| 15 | 17.4 |
| 25 | 22.2 |
| 35 | 27.7 |
| 45 | 34.4 |
| 55 | 42.6 |
| 65 | 52.6 |
| 75 | 65.2 |
| 85 | 81.1 |
| 90 | 90.0 |
| 94 | 100.0 |

B = $C_6H_5Cl$ (100)
Chlorobenzene

| | |
|---|---|
| B | |
| −45.2 | 0 |
| B + A | |
| −47E | 1.7 |
| A | |
| −40 | 2.2 |
| −30 | 3.2 |
| −20 | 4.3 |
| −10 | 5.6 |
| 0 | 7.2 |
| +10 | 9.2 |
| 20 | 11.8 |
| 30 | 15.4 |
| 40 | 20.8 |

B = $C_6H_5Cl$.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 50 | 28.1 |
| 60 | 37.6 |
| 70 | 50.0 |
| 80 | 66.6 |
| 90 | 89.6 |
| 94 | 100.0 |

B = $C_6H_5F$ (109)
Fluorobenzene

| | |
|---|---|
| B | |
| −39.2 | 0.0 |
| B + A | |
| −39.5E | 0.3 |
| A | |
| −25 | 1.0 |
| −15 | 1.8 |
| − 5 | 2.7 |
| + 5 | 3.7 |
| 15 | 5.1 |
| 25 | 6.9 |
| 35 | 9.3 |
| 45 | 13.0 |
| 55 | 19.3 |
| 65 | 29.2 |
| 70 | 41.7 |
| 75 | 54.1 |
| 80 | 66.3 |
| 85 | 78.8 |
| 90 | 90.4 |
| 94 | 100.0 |

B = $C_6H_5I$ (100)
Iodobenzene

| | |
|---|---|
| B | |
| −28.6 | 0 |
| −30.3 | 4.0 |
| B + A | |
| −32E | 8.7 |
| A | |
| −20 | 13.5 |
| −10 | 17.5 |
| 0 | 22.7 |
| +10 | 26.3 |
| 20 | 31.5 |
| 30 | 37.5 |
| 40 | 43.7 |
| 50 | 50.7 |
| 60 | 58.5 |
| 70 | 67.0 |
| 80 | 78.2 |
| 90 | 91.9 |
| 94 | 100.0 |

B = $C_6H_5NO_2$
Nitrobenzene (100)

| | |
|---|---|
| B | |
| 6 | 0 |
| + 1 | 8.6 |
| − 4 | 17.0 |
| − 9 | 24.0 |
| −17m | 31.9 |
| B + A | |
| −15E | 29.7 |

**B = $C_6H_5NO_2$.** — (*Continued*)

| °C | Mol % A |
|---|---|
| **A** | |
| − 5 | 32.3 |
| + 5 | 35.3 |
| 15 | 38.8 |
| 25 | 42.8 |
| 35 | 47.4 |
| 45 | 52.8 |
| 55 | 59.1 |
| 65 | 66.4 |
| 75 | 74.9 |
| 85 | 86.0 |
| 90 | 93.0 |
| 94 | 100.0 |

**B = $C_6H_6$** (100)

| B | |
|---|---|
| 5.6 | 0 |
| **B + $A_2B$** | |
| 4.5E | 1.9 |
| **$A_2B$** | |
| 15 | 3.0 |
| 25 | 4.3 |
| 35 | 6.0 |
| 45 | 8.6 |
| 55 | 12.1 |
| 65 | 17.1 |
| 75 | 24.9 |
| 80 | 30.7 |
| 85 | 38.4 |
| 90 | 48.2 |
| 91.5 | 58.1 |
| **92.5** | **66.6** |
| 91.5 | 73.7 |
| 90 | 76.7 |
| **$A_2B$ + A** | |
| 85E | 84.9 |
| **A** | |
| 90 | 91.4 |
| 92 | 94.8 |
| 94 | 100.0 |

**B = $C_6H_6BrN$**
*p*-Bromoaniline (106)

| A | |
|---|---|
| 94 | 100 |
| 92 | 92.0 |
| 83 | 86.0 |
| 69 | 77.5 |
| 35 | 69.0 |
| **B** | |
| 40 | 22.1 |
| 52 | 16.1 |
| 57 | 11.5 |
| 61.5 | 4.8 |
| 62.5 | 1.4 |
| 63.5 | 0 |

**B = $C_6H_6O$** (111)
Phenol

| B | |
|---|---|
| 41.0 | 0.0 |
| 37.5 | 3.8 |
| 35.0 | 7.0 |
| 32.5 | 11.1 |
| 30.0 | 14.8 |

**B = $C_6H_6O$.** — (*Continued*)

| °C | Mol % A |
|---|---|
| **B + $A_2B$** | |
| 28.5E | 17.4 |
| **$A_2B$** | |
| 35 | 20.1 |
| 40 | 22.6 |
| 45 | 26.1 |
| 50 | 30.5 |
| 55 | 37.3 |
| 60 | 45.2 |
| 65 | 58.8 |
| **$A_2B$ + A** | |
| 66.5E | 66.6 |
| **A** | |
| 75 | 74.6 |
| 85 | 85.8 |
| 90 | 94.0 |
| 94 | 100.0 |

**B = $C_6H_6O_3S$**
Benzenesulfonic acid (110)

| B | |
|---|---|
| 52.5 | 0 |
| 50.0 | 7.6 |
| 47.5 | 13.5 |
| **B + A** | |
| 44.0E | 20.5 |
| **A** | |
| 50.0 | 22.2 |
| 60.0 | 26.8 |
| 70.0 | 34.8 |
| 75.0 | 40.5 |
| 80.0 | 48.7 |
| 85.0 | 60.0 |
| 90.0 | 80.7 |
| 94.0 | 100.0 |

**B = $C_6H_{10}$** (104)
Tetrahydrobenzene

| A | |
|---|---|
| −5 | 3.0 |
| +5 | 3.3 |
| 15 | 3.8 |
| 25 | 5.1 |
| 35 | 6.8 |
| 45 | 9.3 |
| 55 | 13.7 |
| 65 | 21.9 |
| 70 | 29.4 |
| 75 | 42.3 |
| 80 | 55.7 |
| 85 | 70.0 |
| 90 | 83.1 |
| 94 | 100.0 |

**B = $C_6H_{12}$** (104)
Cyclohexane

| B | |
|---|---|
| 6.4 | 0.0 |
| **B + A** | |
| 6.0E | 0.07 |
| **A** | |
| 20 | 0.3 |
| 30 | 0.5 |
| 40 | 0.8 |
| 50 | 1.3 |

**B = $C_6H_{12}$.** — (*Continued*)

| °C | Mol % A |
|---|---|
| **A** | |
| 60 | 1.8 |
| 70 | 2.2 |
| 80 | 3.2 |
| 90 | 4.3 |
| 94 | 100 |
| Two liquid phases | |
| 92.5 | 4.7 90.6 |
| 100 | 6.3 88.7 |
| 110 | 7.6 86.6 |
| 120 | 9.6 84.3 |
| 130 | 11.9 81.7 |
| 140 | 14.5 78.6 |
| 150 | 17.6 74.9 |
| 160 | 21.3 69.1 |
| 170 | 27.9 58.5 |
| 173 | 31.5 53.4 |
| 175crit. | 39.9 |

**B = $C_7H_5ClO$** (102)
Benzoyl chloride

| B | |
|---|---|
| − 0.5 | 0 |
| − 3 | 8.6 |
| **B + A** | |
| − 6E | 15.6 |
| **A** | |
| +10 | 21.5 |
| 20 | 25.9 |
| 30 | 31.2 |
| 40 | 37.5 |
| 50 | 44.8 |
| 60 | 53.3 |
| 70 | 64.8 |
| 80 | 77.0 |
| 90 | 89.6 |
| 94 | 100.0 |

**B = $C_7H_5N$** (107)
Benzonitrile

| B | |
|---|---|
| −13.2 | 0 |
| −16 | 6.3 |
| −22m | 16.3 |
| −27m | 21.0 |
| **B + AB** | |
| −18E | 10.4 |
| **AB** | |
| −10 | 13.7 |
| 0 | 17.8 |
| +10 | 22.9 |
| 20 | 29.3 |
| 30 | 36.5 |
| 35 | 41.7 |
| **38** | **50.0** |
| **AB + A** | |
| +35E | 57.2 |
| **A** | |
| − 5m | 47.7 |
| + 5m | 49.3 |
| 15m | 51.3 |
| 25m | 54.0 |
| 45 | 61.2 |
| 55 | 66.5 |
| 65 | 73.3 |
| 75 | 81.0 |

**B = $C_7H_5N$.** — (*Continued*)

| °C | Mol % A |
|---|---|
| **A** | |
| 85 | 89.3 |
| 90 | 96.5 |
| 94 | 100.0 |

**B = $C_7H_6O$** (105)
Benzaldehyde

| AB | |
|---|---|
| −20 | 15.4 |
| 0 | 19.7 |
| +10 | 22.7 |
| 20 | 26.0 |
| 30 | 30.7 |
| 35 | 34.8 |
| 40 | 41.5 |
| **41.5** | **50.0** |
| 40 | 56.2 |
| **AB + A** | |
| 37.8E | 61.7 |
| **A** | |
| 45 | 64.3 |
| 55 | 68.4 |
| 65 | 73.8 |
| 75 | 80.9 |
| 85 | 89.1 |
| 90 | 94.1 |
| 94 | 100.0 |

**B = $C_7H_6O_2$** (102)
Benzoic acid

| B | |
|---|---|
| 120 | 0.0 |
| 115 | 7.8 |
| 110 | 16.5 |
| 105 | 25.5 |
| 100 | 34.9 |
| 95 | 44.7 |
| 90 | 54.0 |
| 85 | 62.4 |
| **B + A** | |
| 79E | 70.5 |
| **A** | |
| 85 | 80.0 |
| 90 | 90.0 |
| 94 | 100.0 |

**B = $C_7H_7Cl$** (107)
*o*-Chlorotoluene

| B | |
|---|---|
| −36.2 | 0.0 |
| **B + A** | |
| −38.5E | 4.1 |
| **A** | |
| −30 | 4.9 |
| −20 | 6.0 |
| −10 | 7.4 |
| 0 | 9.2 |
| +10 | 11.5 |
| 20 | 14.3 |
| 30 | 18.3 |
| 40 | 23.6 |
| 50 | 31.1 |
| 60 | 41.0 |
| 70 | 55.4 |
| 80 | 72.1 |
| 90 | 90.0 |
| 94 | 100 0 |

**B = $C_7H_7Cl$** (107)
*m*-Chlorotoluene

| °C | Mol % A |
|---|---|
| **B** | |
| −47.8 | 0.0 |
| **B + A** | |
| −50E | 3.0 |
| **A** | |
| −40 | 3.6 |
| −30 | 4.4 |
| −20 | 5.5 |
| −10 | 6.9 |
| 0 | 8.7 |
| +10 | 11.0 |
| 20 | 13.7 |
| 30 | 17.3 |
| 40 | 22.4 |
| 50 | 29.6 |
| 60 | 39.2 |
| 70 | 52.8 |
| 80 | 72.1 |
| 90 | 90.0 |
| 94 | 100.0 |

**B = $C_7H_7Cl$** (107)
*p*-Chlorotoluene

| B | |
|---|---|
| 6.2 | 0.0 |
| 4.5 | 4.5 |
| **A + B** | |
| 2.5 | 9.7 |
| **A** | |
| 10 | 11.7 |
| 20 | 14.5 |
| 30 | 18.6 |
| 40 | 23.8 |
| 50 | 31.3 |
| 60 | 41.1 |
| 70 | 55.4 |
| 80 | 72.1 |
| 90 | 90.0 |
| 94 | 100 |

**B = $C_7H_7NO_2$**
*o*-Nitrotoluene (107)

| B | |
|---|---|
| − 8.5 | 0.0 |
| −11 | 4.4 |
| **B + AB** | |
| −13.5E | 8.5 |
| **AB** | |
| −10 | 9.5 |
| 0 | 12.7 |
| +10 | 17.5 |
| 15 | 21.1 |
| 20 | 25.9 |
| 25 | 32.2 |
| 30 | 43.3 |
| **AB + A** | |
| 31U | 46.9 |
| **A** | |
| 30m | 46.5 |
| 40 | 51.1 |
| 50 | 56.6 |
| 60 | 63.1 |
| 70 | 70.6 |

**B = $C_7H_7NO_2$.** — (*Continued*)

| °C | Mol % A |
|---|---|
| **A** | |
| 80 | 79.9 |
| 90 | 93.1 |
| 94 | 100.0 |

**B = $C_7H_7NO_2$**
*m*-Nitrotoluene (107)

| B | |
|---|---|
| 16 | 0 |
| 15 | 2.2 |
| 10 | 10.8 |
| + 5 | 20.1 |
| 0 | 25.2 |
| − 5 | 30.2 |
| **B + A** | |
| − 9E | 33.6 |
| **A** | |
| 0 | 35.8 |
| +10 | 39.0 |
| 20 | 42.4 |
| 30 | 46.2 |
| 40 | 51.1 |
| 50 | 56.6 |
| 60 | 63.1 |
| 70 | 70.6 |
| 80 | 79.9 |
| 90 | 93.1 |
| 94 | 100.0 |

**B = $C_7H_7NO_2$**
*p*-Nitrotoluene (107)

| B | |
|---|---|
| 52.5 | 0 |
| 50 | 5.0 |
| 45 | 13.8 |
| 40 | 21.7 |
| 35 | 28.0 |
| 30 | 32.7 |
| 25 | 36.9 |
| 20 | 40.7 |
| **B + A** | |
| 16E | 43.0 |
| **A** | |
| 20 | 44.3 |
| 30 | 48.7 |
| 40 | 53.6 |
| 50 | 59.2 |
| 60 | 65.5 |
| 70 | 72.5 |
| 80 | 81.0 |
| 90 | 93.7 |
| 94 | 100.0 |

**B = $C_7H_8$** (95)
Toluene

| B | |
|---|---|
| −93 | 0 |
| **B + AB** | |
| −93.5E | 0.3 |
| **AB** | |
| −80 | 0.7 |
| −70 | 1.2 |
| −60 | 1.8 |
| −50 | 2.6 |

$SbBr_3$.—(*Cont'd*)

B = $C_7H_8$.—(*Cont'd*)

| °C | Mol % A |
|---|---|
| AB | |
| −40 | 3.7 |
| −30 | 5.2 |
| −20 | 8.2 |
| −10 | 13.3 |
| − 5 | 17.7 |
| AB + $A_2B$ | |
| − 1U | 22.4 |
| $A_2B$ | |
| +10 | 28.8 |
| 20 | 36.7 |
| 34m | 54.0 |
| $A_2B$ + A | |
| 30U | 47.5 |
| A | |
| 40 | 51.5 |
| 50 | 56.3 |
| 60 | 62.3 |
| 70 | 69.4 |
| 80 | 79.4 |
| 85 | 85.2 |
| 90 | 92.6 |
| 94 | 100.0 |

B = $C_7H_8O$ (111)
Phenyl methyl ether

| B | |
|---|---|
| −34 | 0 |
| B + AB | |
| −35E | 0.7 |
| AB | |
| −30 | 1.7 |
| −20 | 3.8 |
| −10 | 6.3 |
| 0 | 9.8 |
| +10 | 15.1 |
| 15 | 18.9 |
| 20 | 23.4 |
| 25 | 30.4 |
| 29 | 40.0 |
| **30.5** | **50.0** |
| AB + A | |
| 30E | 51.0 |
| A | |
| 12m | 45.2 |
| 20m | 47.8 |
| 40 | 55.0 |
| 50 | 59.4 |
| 60 | 64.8 |
| 70 | 73.3 |
| 80 | 81.2 |
| 90 | 93.6 |
| 94 | 100.0 |

B = $C_8H_8O$ (102)
Acetophenone

| B | |
|---|---|
| 19.5 | 0 |
| 15 | 8.9 |
| 10 | 15.4 |
| 5 | 20.6 |
| AB + B | |
| 1.5E | 24.0 |

B = $C_8H_8O$.—(*Continued*)

| °C | Mol % A |
|---|---|
| AB | |
| 10 | 26.6 |
| 20 | 30.4 |
| 30 | 36.6 |
| 35 | 42.5 |
| **37.5** | **50.0** |
| 35 | 56.8 |
| AB + A | |
| 31E | 62.7 |
| A | |
| 40 | 64.6 |
| 50 | 67.5 |
| 60 | 71.1 |
| 70 | 76.5 |
| 80 | 84.3 |
| 90 | 94.2 |
| 94 | 100.0 |

B = $C_8H_{10}$ (95)
Ethylbenzene

| B + AB | |
|---|---|
| −93E | 0.1 |
| AB | |
| −70 | 0.25 |
| −60 | 0.4 |
| −50 | 0.6 |
| −40 | 1.0 |
| −30 | 1.5 |
| −20 | 2.3 |
| −10 | 3.9 |
| 0 | 6.4 |
| +10 | 9.8 |
| 15 | 13.2 |
| 20 | 19.5 |
| 25 | 28.6 |
| AB + A | |
| 29E | 37.8 |
| A | |
| 40 | 44.6 |
| 50 | 51.6 |
| 60 | 59.8 |
| 70 | 67.4 |
| 80 | 77.4 |
| 85 | 85.0 |
| 90 | 92.6 |
| 94 | 100.0 |

B = $C_8H_{10}$ (101)
*o*-Xylene

| B | |
|---|---|
| −29 | 0 |
| B + AB | |
| −33E | 3.4 |
| AB | |
| −20 | 5.7 |
| −10 | 8.7 |
| 0 | 13.5 |
| + 5 | 17.2 |
| 10 | 21.8 |
| 15 | 28.0 |
| 20 | 37.0 |
| **24** | **50.0** |
| AB + A | |
| 22.5E | 52.0 |

B = $C_8H_{10}$.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 0m | 46.0 |
| 10m | 48.6 |
| 20m | 51.4 |
| 30 | 54.6 |
| 40 | 58.1 |
| 50 | 62.0 |
| 60 | 66.6 |
| 70 | 72.7 |
| 80 | 81.3 |
| 90 | 93.0 |
| 94 | 100.0 |

B = $C_8H_{10}$ (101)
*m*-Xylene

| B | |
|---|---|
| −57 | 0 |
| B + AB | |
| −59.2E | 2.0 |
| AB | |
| −45 | 3.4 |
| −35 | 4.7 |
| −25 | 6.8 |
| −15 | 10.0 |
| − 5 | 15.8 |
| 0 | 20.3 |
| + 5 | 27.5 |
| 10 | 38.8 |
| **13.5m** | **50.0** |
| AB + A | |
| 13U | 47 |
| A | |
| − 5m | 43.5 |
| + 5m | 45.3 |
| 15 | 47.7 |
| 25 | 50.5 |
| 35 | 53.6 |
| 45 | 57.5 |
| 55 | 62.2 |
| 65 | 68.3 |
| 75 | 75.4 |
| 85 | 85.6 |
| 90 | 93.2 |
| 94 | 100.0 |

B = $C_8H_{10}$ (101)
*p*-Xylene

| B | |
|---|---|
| 14 | 0 |
| 12 | 5.5 |
| B + $A_2B$ | |
| 10E | 10.5 |
| $A_2B$ | |
| 20 | 14.5 |
| 30 | 18.8 |
| 40 | 24.8 |
| 50 | 33.9 |
| 60 | 45.6 |
| 65 | 55.5 |
| 66.5 | 60.3 |
| **67.5** | **66.6** |
| $A_2B$ + A | |
| 66.5E | 68.9 |

B = $C_8H_{10}$.—(*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 70 | 71.4 |
| 75 | 75.8 |
| 80 | 81.2 |
| 85 | 86.9 |
| 88 | 91.1 |
| 91 | 95.0 |
| 94 | 100.0 |

B = $C_8H_{10}O$ (111)
Phenetole

| B | |
|---|---|
| −28.6 | 0.0 |
| B + AB | |
| −29E | 0.55 |
| AB | |
| −20 | 0.9 |
| −10 | 1.7 |
| 0 | 2.8 |
| +10 | 4.8 |
| 20 | 7.4 |
| 30 | 12.1 |
| 35 | 16.5 |
| 40 | 22.5 |
| 45 | 32.6 |
| 47 | 40.4 |
| **48.8** | **50.0** |
| AB + A | |
| 47E | 54.0 |
| A | |
| 10m | 37.0 |
| 20m | 40.9 |
| 30m | 45.2 |
| 40m | 50.0 |
| 50 | 55.5 |
| 60 | 62.2 |
| 70 | 70.0 |
| 80 | 80.0 |
| 90 | 92.6 |
| 94 | 100.0 |

B = $C_9H_{12}$ (101)
Mesitylene

| B | |
|---|---|
| −54.4 | 0 |
| B + AB | |
| −55.2E | 0.7 |
| AB | |
| −40 | 0.9 |
| −30 | 1.2 |
| −20 | 1.9 |
| −10 | 3.2 |
| 0 | 5.9 |
| +10 | 10.2 |
| 20 | 15.7 |
| AB + $A_2B$ | |
| 29U | 26.6 |
| $A_2B$ | |
| 40 | 28.3 |
| 50 | 35.0 |
| 55 | 39.2 |
| 60 | 44.0 |
| 65 | 51.0 |
| 67 | 55.1 |

B = $C_9H_{12}$.—(*Continued*)

| °C | Mol % A |
|---|---|
| $A_2B$ | |
| 69 | 61.1 |
| **69.5** | **66.6** |
| $A_2B$ + A | |
| 69E | 70.4 |
| A | |
| 61m | 64.5 |
| 70 | 71.5 |
| 80 | 81.0 |
| 90 | 94.2 |
| 94 | 100.0 |

B = $C_9H_{12}$ (95)
*n*-Propylbenzene

| AB | |
|---|---|
| −80 | 0.4 |
| −70 | 0.7 |
| −60 | 1.2 |
| −50 | 2.1 |
| −40 | 3.4 |
| −30 | 5.5 |
| −20 | 9.5 |
| −15 | 12.2 |
| −10 | 17.2 |
| − 5 | 24.3 |
| − 1.5m | 33.3 |
| AB + A | |
| − 5E*ca.* | 25.0 |
| A | |
| −20m | 23.3 |
| −10m | 24.4 |
| 0 | 25.8 |
| +10 | 27.8 |
| 20 | 30.5 |
| 30 | 34.1 |
| 40 | 38.6 |
| 50 | 44.3 |
| 60 | 51.5 |
| 70 | 61.5 |
| 80 | 73.5 |
| 90 | 90.0 |
| 94 | 100.0 |

B = $C_9H_{12}$ (101)
Pseudocumene

| B | |
|---|---|
| −57.2 | 0 |
| B + AB | |
| −58.8E | 3.4 |
| AB | |
| −50.0 | 4.0 |
| −40 | 4.8 |
| −30 | 6.0 |
| −20 | 8.3 |
| −10 | 13.0 |
| − 5 | 17.1 |
| 0 | 23.2 |
| + 5 | 31.8 |
| AB + $A_2B$ | |
| 7U | 36.8 |
| $A_2B$ | |
| −15m | 29.4 |
| − 5m | 32.5 |
| + 5m | 36.2 |

B = $C_9H_{12}$.—(*Continued*)

| °C | Mol % A |
|---|---|
| $A_2B$ | |
| 15 | 40.9 |
| 25 | 47.2 |
| **36m** | **66.6** |
| $A_2B$ + A | |
| 33U | 56.2 |
| A | |
| −10m | 47.6 |
| 0m | 49.1 |
| +10m | 50.8 |
| 20m | 52.8 |
| 30m | 55.2 |
| 40 | 58.2 |
| 50 | 62.0 |
| 60 | 66.8 |
| 70 | 72.8 |
| 80 | 80.6 |
| 90 | 92.7 |
| 94 | 100.0 |

B = $C_{10}H_7Br$ (108)
α-Bromonaphthalene

| B | |
|---|---|
| + 3 | 0.0 |
| 0 | 9.8 |
| B + A | |
| − 3.5E | 20.8 |
| A | |
| + 5 | 23.0 |
| 15 | 26.5 |
| 25 | 31.2 |
| 35 | 36.8 |
| 45 | 43.5 |
| 55 | 51.4 |
| 65 | 60.6 |
| 75 | 70.8 |
| 80 | 77.5 |
| 85 | 84.9 |
| 90 | 92.3 |
| 94 | 100.0 |

B = $C_{10}H_7Cl$ (108)
α-Chloronaphthalene

| B | |
|---|---|
| −17 | 0.0 |
| −21 | 5.9 |
| B + A | |
| −24.5E | 11.6 |
| A | |
| −20 | 12.8 |
| −10 | 15.3 |
| 0 | 18.1 |
| +10 | 21.3 |
| 20 | 23.9 |
| 30 | 28.3 |
| 40 | 33.9 |
| 50 | 41.9 |
| 60 | 50.2 |
| 70 | 62.0 |
| 80 | 76.0 |
| 90 | 92.0 |
| 94 | 100.0 |

B = $C_{10}H_7Cl$ (108)
β-Chloronaphthalene

| °C | Mol % A |
|---|---|
| B | |
| 56 | 0.0 |
| 53 | 7.2 |
| 50 | 14.6 |
| 45 | 22.3 |
| 40 | 31.2 |
| B + A | |
| 37.5E | 34.6 |
| A | |
| 40 | 36.3 |
| 45 | 39.3 |
| 50 | 43.0 |
| 55 | 47.3 |
| 60 | 52.2 |
| 65 | 57.7 |
| 70 | 63.8 |
| 75 | 70.4 |
| 80 | 77.4 |
| 85 | 84.8 |
| 90 | 92.3 |
| 94 | 100.0 |

B = $C_{10}H_7NO_2$
α-Nitronaphthalene (108)

| | |
|---|---|
| B | |
| 57 | 0.0 |
| 56 | 3.6 |
| 50 | 12.6 |
| 45 | 20.1 |
| 40 | 26.6 |
| 35 | 32.1 |
| B + AB | |
| 33.5E | 33.4 |
| AB | |
| 35.5 | 37.9 |
| 37.5 | 45.8 |
| **38.2** | **50.0** |
| AB + A | |
| 38E | 50.4 |
| A | |
| 40 | 51.6 |
| 50 | 56.8 |
| 60 | 62.8 |
| 70 | 70.0 |
| 80 | 79.0 |
| 90 | 92.4 |
| 94 | 100.0 |
| AB | |
| 31.5m | 28.9 |
| B | |
| 30.0m | 36.8 |
| B + A | |
| 23.0mE | 43.8 |
| A | |
| 30.0m | 46.8 |

B = $C_{10}H_8$ (108)
Naphthalene

| | |
|---|---|
| B | |
| 79.4 | 0.0 |
| 75.0 | 10.0 |
| 70 0 | 17.6 |

B = $C_{10}H_8$.— (*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| 65.0 | 25.2 |
| 60.0 | 31.7 |
| B + $A_2B$ | |
| 57.0E | 35.2 |
| $A_2B$ | |
| 60 | 42.2 |
| 62.5 | 50.2 |
| 65 | 61.5 |
| **66** | **66.6** |
| $A_2B$ + A | |
| 65 | 69.8 |
| A | |
| 70 | 72.6 |
| 75 | 75.8 |
| 80 | 80.8 |
| 85 | 86.7 |
| 90 | 94.0 |
| 94 | 100.0 |

B = $C_{10}H_{14}$ (101)
p-Cymene

| | |
|---|---|
| B | |
| −75 | 0 |
| B + AB | |
| −77E | 0.8 |
| AB | |
| −70 | 1.0 |
| −60 | 1.6 |
| −50 | 2.9 |
| −40 | 3.4 |
| −30 | 5.0 |
| −20 | 7.5 |
| −10 | 12.1 |
| 0 | 21.5 |
| +10m | **50.0** |
| AB + A | |
| + 5U | 28.3 |
| A | |
| − 7m | 26.5 |
| +20 | 32.2 |
| 30 | 35.5 |
| 40 | 39.5 |
| 50 | 44.5 |
| 60 | 50.5 |
| 70 | 60.4 |
| 80 | 74.1 |
| 90 | 90.8 |
| 94 | 100.0 |

B = $C_{11}H_{16}$ (95)
Amylbenzene

| | |
|---|---|
| AB | |
| −70 | 1.9 |
| −60 | 2.6 |
| −50 | 3.6 |
| −40 | 5.1 |
| −30 | 7.1 |
| −25 | 9.7 |
| −20 | 13.4 |
| −15m | 19.4 |
| −13m | 24.9 |
| AB + A | |
| −17E | 16.4 |

B = $C_{11}H_{16}$.— (*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| −10 | 17.0 |
| 0 | 18.2 |
| +10 | 19.9 |
| 20 | 22.5 |
| 30 | 25.9 |
| 40 | 30.3 |
| 50 | 35.8 |
| 60 | 43.3 |
| 70 | 54.0 |
| 75 | 60.5 |
| 80 | 68.5 |
| 85 | 78.1 |
| 90 | 90.0 |
| 94 | 100.0 |

B = $C_{12}H_{10}$ (103)
Diphenyl

| | |
|---|---|
| B | |
| 70.5 | 0 |
| 65 | 9.7 |
| 60 | 19.3 |
| 55 | 27.6 |
| 50 | 33.6 |
| B + $A_2B$ | |
| 47E | 36.8 |
| $A_2B$ | |
| 50 | 40.0 |
| 55 | 48.1 |
| 57.5 | 56.6 |
| $A_2B$ + A | |
| 60.5U | 66.6 |
| A | |
| 50m | 58.0 |
| 70 | 73.0 |
| 80 | 82.0 |
| 90 | 93.8 |
| 94 | 100.0 |

B = $C_{12}H_{10}N_2$ (154)
Azobenzene

| | |
|---|---|
| A | |
| 95.0 | 100.0 |
| 85.6 | 91.08 |
| 73.4 | 80.0 |
| A + $A_4B$ | |
| 72.4U | 79.0 |
| $A_4B$ | |
| 72.2 | 75.00 |
| 71.2 | 70.00 |
| 66.7 | 60.00 |
| 60.2 | 50.00 |
| 52.9 | 42.69 |
| $A_4B$ + B | |
| 52.8E | 40.0 |
| B | |
| 55.4 | 32.79 |
| 61.9 | 15.66 |
| 64.2 | 7.39 |
| 68.0 | 0.0 |

B = $C_{13}H_{10}O$ (102)
Benzophenone

| | |
|---|---|
| B | |
| 48 | 0.0 |
| 45 | 6.2 |

B = $C_{13}H_{10}O$.— (*Continued*)

| °C | Mol % A |
|---|---|
| B | |
| 40 | 14.4 |
| 35 | 20.4 |
| 20 | 31.4 |
| B + AB | |
| 29E | 26.2 |
| AB | |
| 35 | 29.8 |
| 40 | 33.7 |
| 45 | 39.4 |
| 47.5 | 45.2 |
| **48.5** | **50.0** |
| 47.5 | 56.0 |
| 45 | 61.5 |
| AB + A | |
| 40E | 66.6 |
| A | |
| 50 | 70.0 |
| 60 | 74.4 |
| 70 | 79.7 |
| 80 | 85.5 |
| 90 | 94.5 |
| 94 | 100.0 |

B = $C_{13}H_{12}$ (103)
Diphenylmethane

| | |
|---|---|
| B | |
| 26.0 | 0.0 |
| B + $A_2B$ | |
| 22.5E | 6.4 |
| $A_2B$ | |
| 30 | 8.7 |
| 40 | 11.8 |
| 50 | 16.4 |
| 60 | 21.9 |
| 70 | 30.0 |
| 75 | 35.0 |
| 80 | 41.1 |
| 85 | 49.7 |
| 88 | 56.4 |
| **90** | **66.6** |
| 88 | 73.7 |
| 85 | 79.7 |
| $A_2B$ + A | |
| 82E | 84.5 |
| A | |
| 85 | 87.4 |
| 90 | 96.6 |
| 94 | 100.0 |

B = $C_{14}H_{10}O_2$
Benzil (154)

| | |
|---|---|
| A | |
| 95.0 | 100.0 |
| 86.1 | 93.10 |
| 64.6 | 75.59 |
| 48.0 | 66.35 |
| A + B | |
| 36.2E | |
| B | |
| 41.6 | 55.89 |
| 44.1 | 53.35 |
| 66.3 | 37.77 |
| 76.0 | 27.40 |
| 86.1 | 13.28 |
| 94.0 | 0.0 |

B = $C_{14}H_{12}$ (154)
Stilbene

| °C | Mol % A |
|---|---|
| A | |
| 94.9 | 100.0 |
| 89.5 | 90.03 |
| 81.7 | 80.00 |
| 81.0 | 79.20 |
| 69.0 | 70.03 |
| vis. | 70–60 |
| $A_2B$ | |
| 101 | 60.00 |
| 102 | 58.40 |
| 94.3 | 51.18 |
| $A_2B$ + B | |
| 90.0E | 40.69 |
| B | |
| 100.0 | 34.02 |
| 104.5 | 30.28 |
| 112.0 | 21.36 |
| 120.0 | 10.04 |
| 125.0 | 0.0 |

B = $C_{14}H_{14}$ (154)
Dibenzyl

| | |
|---|---|
| A | |
| 94.9 | 100.0 |
| 85.1 | 89.74 |
| A + $A_4B$ | |
| 84.3E | |
| $A_4B$ | |
| 85.6 | 85.00 |
| 87.1 | 78.84 |
| 84.3 | 70.00 |
| 79.0 | 60.42 |
| 72.2 | 52.58 |
| 63.3 | 44.88 |
| 61.8 | 43.09 |
| 53.0 | 36.10 |
| 43.2 | 27.00 |
| $A_4B$ + B | |
| 42.8 | |
| B | |
| 46.6 | 13.96 |
| 50.5 | 3.74 |
| 51.5 | 0.0 |

B = $C_{19}H_{16}$ (103)
Triphenylmethane

| | |
|---|---|
| B | |
| 92 | 0 |
| 85 | 13.0 |
| 80 | 22.5 |
| 70 | 37.4 |
| 60 | 48.8 |
| B + A | |
| 48E | 58.1 |
| A | |
| 60 | 65.2 |
| 70 | 72.4 |
| 80 | 81.1 |
| 90 | 93.4 |
| 94 | 100.0 |

$SbI_3$
B = $C_{12}H_{10}$ (103)
Diphenyl

| °C | Mol % A |
|---|---|
| B | |
| 70.5 | 0 |
| B + $A_2B$ | |
| 68.0E | 1.1 |
| $A_2B$ | |
| 80 | 1.8 |
| 90 | 2.6 |
| 100 | 3.7 |
| 110 | 5.0 |
| 120 | 7.1 |
| 130 | 10.0 |
| 140 | 15.3 |
| 145 | 18.8 |
| 150 | 23.5 |
| 155 | 31.7 |
| 160 | 54.9 |
| **161** | **66.6** |
| $A_2B$ + A | |
| 160 | 81.7 |
| A | |
| 163 | 92.2 |
| 166 | 100.0 |

$SiC_{24}H_{20}$
Silicon tetraphenyl
B = $C_{26}H_{20}$ (127)
Tetraphenylethylene

| °C | Wt. % B |
|---|---|
| A | |
| 233 | 0 |
| A + B | |
| 188.2E | 58.5 |
| B | |
| 222.8 | 100 |

$SnCl_4$
B = $C_2H_4O_2$ (58)
Methyl formate

| °C | Mol % A |
|---|---|
| $AB_2$ | |
| − 5 | 10 |
| +26 | 15 |
| 50.6 | 20 |
| 73 | 25 |
| 80 | 27.5 |
| 82.3 | 30 |
| 83.1 | 32 |
| **83.3** | **33.3** |
| 83.2 | 34 |
| 82.9 | 36 |
| 82.5 | 38 |
| 81.7 | 40 |
| 80 | 43 |
| 76.9 | 47.6 |
| 76.2 | 48.9 |
| 74.2 | 52.3 |
| 73.6 | 53.8 |
| 72 | 56.9 |
| 71.2 | 58 |
| 70.4 | 59.5 |
| 68 | 64 |

### $SnCl_4$.—(*Cont'd*)

B = $C_2H_4O_2$.—(*Continued*)

| °C | Mol % A |
|---|---|
| | $AB_2$ |
| 65 | 70 |
| 62.4 | 74 |
| 59.4 | 78.5 |
| 54.4 | 84 |
| 44.4 | 92.3 |
| 38.4 | 94 |
| | A |
| −33 | 100 |

B = $C_3H_6O_2$ (58, 59)
Ethyl formate

| | |
|---|---|
| | $AB_2$ |
| −10 | 10 |
| +15 | 20 |
| 33.5 | 25.9 |
| 46 | 30.5 |
| 48 | 31.8 |
| **49** | **33.3** |
| 48.7 | 33.7 |
| 48.6 | 33.9 |
| 47.1 | 36 |
| 45.5 | 38.3 |
| 44 | 40 |
| 38.2 | 46 |
| 32.7 | 52 |
| 28 | 58 |
| 24 | 65 |
| 20 | 73 |
| 16 | 80 |
| 10 | 90 |
| | A |
| −33 | 100 |

B = $C_9H_{10}O_2$ (58, 59)
Ethyl benzoate

| | |
|---|---|
| | $AB_2$ |
| 16 | 5 |
| 27.5 | 10 |
| 33.8 | 15 |
| 39.5 | 20 |
| 43.3 | 25 |
| 44 | 27.5 |
| 45 | 30 |
| 45.1 | 31.5 |
| 45.3 | 33 |
| **45.5** | **33.3** |
| 45.4 | 33.6 |
| 45.3 | 34 |
| 45 | 36 |
| 44.8 | 38 |
| 44 | 40 |
| 43.8 | 41.5 |
| | $AB_2$ + AB |
| 42E | 42.5 |
| | AB |
| 43.4 | 43.5 |
| 44.8 | 45 |
| 47.3 | 48 |
| **47.5** | **50** |
| 47.3 | 52 |

B = $C_5H_{10}O_2$.—(*Continued*)

| °C | Mol % A |
|---|---|
| | AB |
| 46.4 | 55 |
| 44.5 | 60 |
| 36.7 | 70 |
| 26.5 | 80 |
| 6.0 | 90 |
| | A |
| −33 | 100 |

### $SnI_4$

B = Various organic compounds (169)

### $SnI(CH_3)_3$

B = $C_6H_7N$ (11)
Aniline

| °C | Mol % B |
|---|---|
| | $AB_2$ |
| 52 | 6.88 |
| 77 | 20.11 |
| 88 | 34.21 |
| 93.5 | 50.77 |
| 95 | 60.84 |
| 95.2 | 66.55 |
| 94.5 | 72.22 |
| 93 | 76.2 |
| 92 | 78.96 |
| 90.7 | 81.83 |

### $SnC_{24}H_{20}$

Tin tetraphenyl
B = $C_{18}H_{15}Sb$ (24)
Triphenylstibine

| °C | Mol % A |
|---|---|
| | A |
| 223 | 100 |
| | A + B |
| 49 | *ca.* 1 |
| | B |
| 49.8 | 0 |

### $PbCl_2$

B = $C_5H_5N$ (38)
Pyridine

| | |
|---|---|
| | $AB_2$ |
| −20 | 0.0861 |
| 0 | 0.1036 |
| +22 | 0.1305 |
| 44 | 0.159 |
| 65 | 0.215 |
| 76 | 0.254 |
| 90 | 0.303 |
| 94 | 0.318 |
| 102 | 0.320 |

### $PbBr_2$

B = $C_5H_5N$ (38)
Pyridine

| | |
|---|---|
| | $AB_3$ |
| −26 | 0.222 |
| −10 | 0.199 |
| − 5 | 0.183 |
| 0 | 0.174 |
| +13 | 0.144 |

B = $C_5H_5N$.—(*Continued*)

| °C | Mol % A |
|---|---|
| | $AB_3$ + $AB_2$ |
| 19U | |
| | $AB_2$ |
| 26 | 0.127 |
| 45 | 0.144 |
| 64 | 0.174 |
| 77 | 0.211 |
| 95 | 0.289 |
| 100 | 0.313 |
| 105 | 0.338 |

### $PbI_2$

B = $C_5H_5N$ (38)
Pyridine

| | |
|---|---|
| | B + $AB_3$ |
| −43.5E | |
| | $AB_3$ |
| −37 | 0.0284 |
| −28 | 0.0289 |
| −20 | 0.0300 |
| − 9 | 0.0319 |
| 0 | 0.0343 |
| + 3 | 0.0369 |
| | $AB_3$ + $AB_2$ |
| 6U | 0.0386 |
| | $AB_2$ |
| 15 | 0.0360 |
| 35 | 0.0323 |
| 57 | 0.0326 |
| 77 | 0.0392 |
| 92 | 0.0498 |
| 98 | 0.0584 |
| 105 | 0.0636 |
| 108 | 0.0704 |
| 112 | 0.0764 |

### $Pb(NO_3)_2$

B = $C_5H_5N$ (160)
Pyridine

| | |
|---|---|
| | $AB_4$ |
| −19.4 | 0.696 |
| −14.5 | 0.507 |
| −10.0 | 0.453 |
| 0.0 | 0.845 |
| + 5.4 | 0.930 |
| 8.7 | 1.272 |
| 14.72 | 1.445 |
| 19.97 | 1.595 |
| 24.75 | 2.002 |
| 30.03 | 2.555 |
| 34.97 | 3.05 |
| 40.03 | 3.90 |
| 45.00 | 5.00 |
| 49.97 | 6.65 |
| | $AB_3$ |
| 59.52 | 8.06 |
| 70.00 | 10.15 |
| 80.00 | 12.81 |
| 89.93 | 17.7 |
| 94.94 | 23.5 |
| | $A_3B_2$ |
| 99.89 | 25.5 |
| 104.90 | 27.2 |
| 109.90 | 28.2 |

### $Pb(CHO_2)_2$

Formate
B = $CH_2O_2$ (51)
Formic acid

| °C | Mol % A |
|---|---|
| | A |
| 20 | 0.21 |
| 73.1 | 0.30 |
| 109.4 | 0.42 |
| 124.5 | 0.51 |

### $CdI_2$

B = $C_2H_4O_2$ (113)
Methyl formate

| | |
|---|---|
| | A? |
| 0 | 0.139 |
| 5 | 0.133 |
| 10 | 0.126 |
| 15 | 0.120 |
| 20 | 0.115 |
| 25 | 0.110 |
| 30 | 0.104 |

B = $C_2H_6O$
Ethyl alcohol (31, 113, 150)

| | |
|---|---|
| | A |
| 0 | 5.11 |
| 5 | 7.88 |
| 10 | 10.77 |
| 15 | 11.6 |
| 20 | 12.2 |
| 25 | 11.60 |
| 30 | 11.50 |
| 35 | 11.45 |
| 40 | 11.36 |

B = $C_3H_6O_2$ (113)
Ethyl formate

| | |
|---|---|
| | A? |
| 0 | 0.237 |
| 5 | 0.230 |
| 10 | 0.220 |
| 15 | 0.208 |
| 20 | 0.187 |
| 25 | 0.163 |

B = $C_3H_8O$
*n*-Propyl alcohol (113, 150)

| | |
|---|---|
| | A? |
| 0 | 2.96 |
| 5 | 5.18 |
| 10 | 7.01 |
| 15 | 8.11 |
| 20 | 9.14 |
| 25 | 8.62 |
| 30 | 8.11 |
| 35 | 8.14 |
| 40 | 8.14 |

B = $C_3H_8O$ (113)
Isopropyl alcohol

| | |
|---|---|
| | A? |
| 0 | 8.74 |
| 5 | 8.81 |
| 10 | 8.86 |
| 15 | 8.89 |
| 30 | 8.89 |

B = $C_4H_8O_2$
Ethyl acetate (113, 119)

| °C | Mol % A |
|---|---|
| | A? |
| 10 | 0.397 |
| 15 | 0.416 |
| 18 | 0.441 |
| 20 | 0.439 |
| 25 | 0.462 |
| 30 | 0.484 |

B = $C_4H_8O_2$ (113)
*n*-Propyl formate

| | |
|---|---|
| | A |
| 0 | 0.580 |
| 5 | 0.555 |
| 10 | 0.523 |
| 15 | 0.488 |
| 20 | 0.439 |
| 25 | 0.380 |

B = $C_5H_5N$ (113)
Pyridine

| | |
|---|---|
| | A? |
| 60 | 0.118 |
| 65 | 0.240 |
| 70 | 0.406 |
| 75 | 0.664 |
| 80 | 1.08 |
| 85 | 1.89 |
| 90 | 4.53 |
| 95 | 5.12 |

B = $C_6H_7N$ (113)
Aniline

| | |
|---|---|
| | A? |
| 40 | 0.386 |
| 50 | 0.594 |
| 60 | 0.807 |
| 70 | 1.045 |
| 80 | 1.32 |
| 90 | 1.67 |
| 100 | 2.30 |

B = $C_9H_7N$ (113)
Quinoline

| | |
|---|---|
| | A? |
| 75 | 1.63 |
| 80 | 1.88 |
| 85 | 2.13 |
| 90 | 2.45 |
| 95 | 2.78 |
| 100 | 3.17 |

### $HgCl_2$

B = $CH_4O$
Methyl alcohol (22, 32, 150)

| | |
|---|---|
| | A? |
| −34 | 0.96 |
| −15 | 1.70 |
| + 4 | 3.44 |
| 8.5 | 3.84 |
| 12 | 4.30 |
| 20 | 5.80 |
| 25 | 7.28 |
| 38.2 | 12.7 |

B = $CH_4O$.—(*Continued*)

| °C | Mol % A |
|---|---|
| | A? |
| 51 | 15.7 |
| 74 | 17.5 |
| 100 | 20.5 |
| 127 | 26.3 |
| 242.6 | 0.14 |
| crit. | |

B = $C_2H_4O_2$ (32)
Acetic acid

| | |
|---|---|
| | A? |
| 21 | 0.61 |
| 33 | 1.15 |
| 43 | 1.39 |
| 50 | 1.57 |
| 61 | 1.89 |
| 87 | 2.66 |
| 95 | 2.93 |
| 115 | 4.05 |
| 127 | 5.24 |
| 145 | 7.30 |
| 182 | 15.15 |
| 207 | 21.40 |

B = $C_2H_6O$
Ethyl alcohol (22, 32, 39, 150)

| | |
|---|---|
| | A? |
| −60 | 0.52 |
| −40 | 1.81 |
| −20 | 4.53 |
| −11 | 5.26 |
| − 5 | 6.70 |
| 0 | 6.61 |
| + 8.5 | 7.08 |
| 10 | 7.21 |
| 20 | 7.46 |
| 25 | 7.81 |
| 31 | 8.09 |
| 38.2 | 8.6 |
| 51 | 9.8 |
| 63 | 11.1 |
| 80 | 13.5 |
| 93 | 15.2 |
| 100 | 16.5 |
| 115 | 20.7 |
| 138 | 26.4 |

B = $C_3H_6O$
Acetone (2, 22, 32, 35, 60, 116)
*See* Fig. 11, p. 212

B = $C_4H_8O_2$
Ethyl acetate (2, 32, 39, 60, 64, 115, 119)
*See* Fig. 12, p. 213

B = $C_4H_{10}O$
Ether (32, 60)

| | |
|---|---|
| | A? |
| −47 | 0.161 |
| −40 | 0.168 |
| −20 | 0.168 |

B = $C_4H_{10}O$.— (*Continued*)

| °C | Mol % A |
|---|---|
| A? | |
| 0 | 0.173 |
| +13 | 0.169 |
| 18 | 0.174 |
| 33.5 | 0.174 |
| 83 | 0.249 |
| 100 | 0.259 |
| 115 | 0.269 |

B = $C_5H_5N$ (73, 144, 147)
Pyridine

| °C | Mol % A |
|---|---|
| $AB_2$ | |
| −32.8 | 0.82 |
| −21.9 | 2.43 |
| + 0.02 | 4.22 |
| 12.58 | 5.76 |
| 18.78 | 6.71 |
| 23.60 | 7.42 |
| 27.23 | 7.85 |
| 31.05 | 8.62 |
| 40.90 | 10.75 |
| 50.10 | 13.50 |
| 60.03 | 16.45 |
| 70.15 | 20.20 |
| 70.8 | 19.75 |
| 74.6 | 21.20 |
| 75.2 | 21.36 |
| $AB_2$ + AB | |
| 76U | |
| AB | |
| 83.5 | 22.9 |
| 86.5 | 24.3 |
| 87.3 | 24.7 |
| 90.4 | 25.1 |
| 97.0 | 27.4 |
| 99.5 | 27.9 |
| 100.5 | 28.5 |
| 104.1 | 30.5 |
| 104.2 | 31.0 |
| AB + $A_3B$? | |
| 106.2U | |
| $A_3B$? | |
| 106.4 | 32.1 |
| 109.8 | 32.8 |
| 113.6 | 33.2 |
| 114.0 | 33.4 |
| 115.7 | 33.5 |
| 118.2 | 34.2 |
| 124.2 | 35.1 |
| 129.4 | 35.7 |
| 145.5 | 40.1 |
| $AB_2$ | |
| 76.4m | 22.0 |
| 78.0m | 22.4 |
| 78.7m | 22.8 |
| 80.2m | 23.6 |
| 82.5m | 24.3 |
| 89.0m | 27.5 |
| 90.8m | 27.9 |
| 94.1m | 30.3 |
| **96.0m** | **33.3** |

B = $C_6H_6$ (60, 65)

| °C | Mol % A |
|---|---|
| A? | |
| 11 | 0.115 |
| 15 | 0.156 |
| 38.8 | 0.229 |
| 40.5 | 0.249 |
| 41 | 0.179 |
| 55 | 0.243 |
| 84 | 0.525 |

$HgBr_2$
B = $C_5H_5N$ (144)
Pyridine

| | |
|---|---|
| $AB_2$ | |
| 9 | 4.9 |
| 43.5 | 10.0 |
| 57 | 12.5 |
| 68 | 14.9 |
| 89 | 19.7 |
| 106 | 25.4 |
| 115.5 | 30.4 |
| **118** | **33.3** |
| 117 | 33.9 |
| $AB_2$ + AB | |
| 107E | 39 |
| AB | |
| 108 | 39.5 |
| 113 | 41.9 |
| 118 | 43.9 |
| 121 | 46.2 |
| **123** | **50.0** |
| AB + $A_3B_2$ | |
| 122.5E | 52 |
| $A_3B_2$ | |
| 131 | 54.9 |
| **134** | **60.0** |
| 133 | 64.0 |

B = $C_6H_7N$ (144)
Aniline

| | |
|---|---|
| $AB_2$ | |
| 62.5 | 4.5 |
| 75 | 6.9 |
| 84 | 9.7 |
| 93.5 | 14.2 |
| 100 | 18.8 |
| 106 | 24.1 |
| 109 | 29.5 |
| 109.5 | 30.6 |
| **110** | **33.3** |
| AB | |
| 111 | 33.9 |
| 112 | 35.3 |
| 116 | 37.3 |
| 122 | 45.5 |
| **124** | **50.0** |
| 123 | 55.4 |
| 117.7 | 59.6 |

B = $C_9H_7N$ (144)
Quinoline

| °C | Mol % A |
|---|---|
| $AB_2$ | |
| 88 | 4.4 |
| 111 | 8.9 |
| 127 | 14.3 |
| 134 | 17.6 |
| **148** *ca.* | **33.3** |

$HgI_2$
B = $C_5H_5N$
Pyridine (82, 144)

| | |
|---|---|
| $AB_2$ | |
| −50 | 0.342 |
| −42 | 0.495 |
| −31.5 | 0.772 |
| −20 | 1.36 |
| −10 | 1.96 |
| − 0.1 | 2.95 |
| + 8.83 | 3.78 |
| 10 | 5.0 |
| 20.2 | 5.32 |
| 25.5 | 6.32 |
| 35.28 | 8.42 |
| 42.5 | 9.8 |
| 50.02 | 11.68 |
| 55.05 | 12.5 |
| 60.07 | 14.0 |
| 66.5 | 15.14 |
| 83 | 19.3 |
| 90.08 | 21.7 |
| 102.5 | 26.3 |
| 107 | 29.6 |
| **108** | **33.3** |
| 107 | 34.6 |
| 103 | 38.0 |
| 97 | 43.0 |
| 88.5 | 46.7 |
| $AB_2$ + AB | |
| 87E | 47 |
| AB | |
| 89 | 48.5 |
| **90** | **50.0** |
| 89 | 50.6 |
| AB + $A_3B_2$ | |
| 88.5E | 51 |
| $A_3B_2$ | |
| 93.5 | 51.3 |
| 96 | 51.6 |
| 108 | 52.7 |
| 109 | 53.2 |
| 122 | 55.4 |
| 135 | 57.9 |

B = $C_6H_5NO_2$
Nitrobenzene (18, 143)

| | |
|---|---|
| A (red) | |
| 97.9 | 0.73 |
| 108.0 | 1.02 |
| 118.1 | 1.32 |
| 124.8 | 1.56 |
| 126.5 | 1.63 |
| 128.6m | 1.74 |
| 130.7m | 1.81 |

B = $C_6H_5NO_2$.— (*Continued*)

| °C | Mol % A |
|---|---|
| A (red) + A (yellow) | |
| 127.5U | 1.66 |
| A (yellow) | |
| 116.8m | 1.32 |
| 123.9m | 1.56 |
| 126.2m | 1.63 |
| 128.9 | 1.74 |
| 131.1 | 1.81 |
| 133.1 | 1.87 |
| 144.3 | 2.46 |
| 155.0 | 3.07 |
| 165.8 | 3.90 |
| 173.7 | 4.63 |
| 180.4 | 5.42 |
| 197.0 | 8.03 |
| 214.6 | 12.04 |
| 229.2 | 18.81 |
| 235.9 | 23.43 |
| 244.7 | 49.57 |
| 245.1 | 72.62 |
| 247.0 | 86.81 |
| 250.4 | 94.41 |
| 255.3 | 100.00 |

B = $C_6H_7N$ (128)
Aniline
*See* Fig. 13, p. 213

B = $C_7H_7NO_2$
*p*-Nitrotoluene (18, 143)

| | |
|---|---|
| A (red) | |
| 99.3 | 0.83 |
| 107.8 | 1.06 |
| 119.6 | 1.47 |
| 132.9m | 2.08 |
| 136.8m | 2.29 |
| A (red) + A (yellow) | |
| 128U | 1.85 |
| A (yellow) | |
| 92.3m | 0.83 |
| 103.8m | 1.06 |
| 118.3m | 1.47 |
| 134.1 | 2.08 |
| 138.7 | 2.29 |
| 159.3 | 3.60 |
| 179.2 | 5.67 |
| 205.6 | 9.92 |
| 227.3 | 16.21 |
| 233.2 | 18.97 |
| 238.2 | 23.69 |
| 242.5 | 26.31 |
| 247.0 | 33.00 |
| 249.6 | 41.49 |
| 250.8 | 82.96 |
| 251.2 | 89.57 |
| 255.3 | 100.00 |

B = $C_9H_7N$ (144)
Quinoline

| | |
|---|---|
| $AB_2$ | |
| 100 | 4.7 |
| 115.5 | 9.1 |
| 130.5 | 13.2 |

B = $C_9H_7N$.— (*Continued*)

| °C | Mol % A |
|---|---|
| $AB_2$ + AB | |
| 138U | 23.1 |
| AB | |
| 145 | 26.7 |
| 151 | 29.8 |
| 153 | 31.4 |
| 156 | 35.4 |
| 160 | 37.7 |
| 163 | 41.6 |
| 165 | 43.0 |
| 167 | 46.1 |
| **169** | **50.0** |
| 166.5 | 54.4 |

$Hg(CN)_2$
B = $C_5H_5N$ (144)
Pyridine

| | |
|---|---|
| $AB_6$ | |
| 9 | 7.1 |
| 11 | 8.7 |
| 12.3 | 10.1 |
| 12.2 | 10.4 |
| 13 | 11.3 |
| 13.5 | 12.9 |
| 14.5 | 13.8 |
| $AB_6$ + $AB_3$ | |
| 15U | 15 |
| $AB_3$ | |
| 16.5 | 15.8 |
| 20.5 | 15.9 |
| $AB_3$ + $AB_2$ | |
| 22U | 17 |
| $AB_2$ | |
| 22.5 | 17.3 |
| 28.5 | 18.4 |
| 32 | 19.3 |
| 38 | 20.6 |
| 42 | 22.3 |
| 45 | 22.9 |
| 46 | 23.7 |
| $AB_2$ + $A_2B_3$ | |
| 48U | 25 |
| $A_2B_3$ | |
| 53 | 25.3 |
| 54.5 | 26.0 |
| 56.5 | 26.6 |
| $A_2B_3$ + AB | |
| 58U | 27 |
| AB | |
| 68 | 27.5 |
| 70 | 27.7 |
| 86 | 29.0 |
| 111 | 32.0 |
| 122.5 | 33.8 |
| 125 | 34.4 |
| 141 | 38.3 |
| **154** | **50.0** |

B = $C_6H_7N$ (144)
Aniline

| | |
|---|---|
| $AB_2$ | |
| 41 | 3.7 |
| 49 | 5.7 |
| 58.5 | 7.7 |

B = $C_6H_7N$.— (*Continued*)

| °C | Mol % A |
|---|---|
| $AB_2$ | |
| 65 | 9.2 |
| 77 | 14.2 |
| 83.5 | 18.2 |
| 84 | 19.7 |
| 88.5 | 23.4 |
| $AB_4$ | |
| 26m | 4.9 |
| 30.5m | 5.7 |
| 35m | 7.7 |
| 38.5m | 9.2 |

B = $C_9H_7N$ (144)
Quinoline

| | |
|---|---|
| $AB_3$ | |
| 45 | 4.2 |
| 54 | 6.0 |
| $AB_3$ + $AB_2$(?) | |
| 60U | 7.5 |
| $AB_2$(?) | |
| 89 | 8.2 |
| 99 | 9.2 |
| 137 | 13.2 |
| 161 | 17.4 |
| 180 | 22.5 |
| 192 | 27.1 |

$Hg(C_2H_3O_2)_2$
Acetate
B = $C_2H_4O_2$ (79)
Acetic acid

| | |
|---|---|
| A | |
| 14.3 | 0.906 |
| 15.0 | 0.600 |
| 16.2 | 0.296 |
| 17.0 | 0.000 |

B = $C_6H_6O$ (79)
Phenol

| | |
|---|---|
| A | |
| − 1.2 | 17.68 |
| +15.5 | 13.32 |
| 32.0 | 5.32 |
| 42.0 | 0.00 |

$HgC_{12}H_{10}$
Mercury diphenyl
B = $C_{18}H_{15}Sb$ (24)
Triphenylstibine

| °C | Mol % B |
|---|---|
| A | |
| 121.8 | 0 |
| A + B | |
| 40.5E | 80.5 |
| B | |
| 49.8 | 100 |

B = $C_{18}H_{15}Bi$ (24)
Triphenyl-bismuthine

| | |
|---|---|
| A | |
| 121.8 | 0 |
| A + B | |
| 63.5E | 66.5 |
| B | |
| 76.0 | 100 |

### $CuCl_2$

B = $C_5H_5N$ (83)
Pyridine

| °C | Mol % A |
|---|---|
| | $AB_6$ |
| −17.3 | 0.0824 |
| −13.0 | 0.107 |
| −12.1 | 0.115 |
| −11.2 | 0.131 |
| −10.0m | 0.174 |
| | $AB_6 + AB_2$ |
| −10.0U | 0.159 |
| | $AB_2$ |
| − 8.9 | 0.159 |
| + 2.0 | 0.162 |
| 10.00 | 0.1725 |
| 25.00 | 0.205 |
| 35.00 | 0.225 |
| 45.00 | 0.249 |
| 49.00 | 0.273 |
| 53.00 | 0.291 |
| 55.00 | 0.300 |
| 60.00m | 0.333 |
| 61.00m | 0.336 |
| 62.00m | 0.363 |
| | $AB_2 + A_2B_3$ |
| 58.00U | |
| | $A_2B_3$ |
| 63.00 | 0.320 |
| 64.00 | 0.325 |
| 65.00 | 0.316 |
| 70.00 | 0.335 |
| 75.00 | 0.372 |
| 85.00 | 0.450 |
| 95.00 | 0.542 |

### $Cu(C_2H_3O_2)_2$

Acetate
B = $C_5H_5N$ (81)
Pyridine

| | |
|---|---|
| | $AB_4$ |
| −11.6 | 0.167 |
| + 2.0 | 0.262 |
| 13.0 | 0.452 |
| 26.45 | 0.708 |
| 37.40 | 1.255 |
| 41.9 | 1.383 |
| 43.2 | 1.507 |
| 45.2m | 1.875 |
| | $AB_4 + AB$ |
| 44.7U | |
| | AB |
| 34.8m | 1.670 |
| 55.7 | 1.845 |
| 64.3 | 1.922 |
| 76.2 | 2.161 |
| 83.3 | 2.430 |
| 95.4 | 2.850 |

### $AgClO_4$

B = $C_5H_5N$ (77)
Pyridine

| | |
|---|---|
| | B |
| −40.3 | 0 |
| −41.5 | 1.57 |

B = $C_5H_5N$.— (*Continued*)

| °C | Mol % A |
|---|---|
| | B + $AB_4$ |
| −43E | 2.87 |
| | $AB_4$ |
| −35 | 3.33 |
| −11.5 | 5.04 |
| − 1.3 | 6.08 |
| +25 | 9.15 |
| 36.1 | 11.02 |
| 49.2 | 13.70 |
| 60.4 | 16.72 |
| 66.8 | 21.01 |
| | $AB_4 + A_4B_9$ |
| 68.0U | 21.43 |
| | $A_4B_9$ |
| 71.0 | 21.91 |
| 75.0 | 22.34 |
| 86.3 | 24.37 |
| | $A_4B_9 + AB_2$ |
| 95.6U | 25.88 |
| | $AB_2$ |
| 110 | 27.60 |

B = $C_6H_6$ (42, 43)

| | |
|---|---|
| | A |
| 480 | 100 |
| 160 | 41.8 |
| 159 | 40.8 |
| 140m | 38.8 |
| | A + AB |
| 145U | 39.3 |
| | AB |
| 138.5 | 36.1 |
| 115.5 | 27.8 |
| 92 | 20.1 |
| 80.3 | 15.16 |
| 50 | 4.06 |
| 25 | 1.95 |
| | AB + B |
| 5.12E | 1.32 |
| | B |
| 5.48 | 0.00 |

B = $C_6H_7N$ (44)
Aniline

| | |
|---|---|
| | B |
| −6.15 | 0.00 |
| | B + $AB_6$ |
| −6.6E | 0.33 |
| | $AB_6$ |
| 25.0 | 2.30 |
| 40.0 | 5.46 |
| 50.1 | 8.42 |
| **60.52** | **14.3** |
| 55.0 | 16.68 |
| | $AB_6 + AB_3$ |
| 48.3U | 18.1 |
| | $AB_3$ |
| 56.1 | 19.45 |
| | $AB_3 + AB_2$ |
| 66.6U | 22.0 |
| | $AB_2$ |
| 88 | 23.0 |
| | A |
| 480 | 100.0 |

B = $C_7H_8$ (44.5)
Toluene

| °C | Wt. % A |
|---|---|
| | A |
| 75 | 54.60 |
| 50 | 52.68 |
| 25 | 50.30 |
| | A + AB |
| 22.6U | |
| | AB |
| 18 | 44.11 |
| +16 | 42.00 |
| 0 | 26.41 |
| −24.1 | 6.01 |
| −73.5 | 0.00 |

### $CoCl_2$

B = $C_5H_5N$ (129)
Pyridine

| °C | Mol % A |
|---|---|
| | $AB_6$ |
| −50.3 | 0.2550 |
| −45.0 | 0.2553 |
| −30.0 | 0.2566 |
| −19.6 | 0.2569 |
| −10.0 | 0.2629 |
| 0.0 | 0.2626 |
| | $AB_6 + AB_4$ |
| +15U | |
| | $AB_4$ |
| 23 | 0.347 |
| 25 | 0.350 |
| 34.6 | 0.457 |
| 37.6 | 0.460 |
| 44.6 | 0.582 |
| 47.2 | 0.622 |
| 51.0 | 0.679 |
| 55.0 | 0.729 |
| 60.0 | 0.810 |
| 64.2 | 0.896 |
| 68.0 | 0.964 |
| | $AB_4 + AB_2$ |
| 70U | |
| | $AB_2$ |
| 74.8 | 1.296 |
| 78.2 | 1.395 |
| 79.8 | 1.490 |
| 88.0 | 2.022 |
| | $AB_2 + A$ |
| 90U | |
| | A |
| >90 | |

### $AlCl_3$

B = $CCl_4$ (66)

| | |
|---|---|
| | A? |
| 4 | 0.54 |
| 14 | 0.16 |
| 20 | 0.11 |
| 34 | 0.043 |

B = $CHCl_3$ (66)

| | |
|---|---|
| | A? |
| −15 | 0.38 |
| 0 | 0.59 |
| +25 | 0.42 |

B = $C_6H_4BrNO_2$ *o*-Bromonitrobenzene (96)

| °C | Mol % A |
|---|---|
| | B |
| 38.5 | 0 |
| 32 | 10.9 |
| 26 | 18.5 |
| | B + AB |
| 20E | 24.3 |
| | AB |
| 30 | 26.8 |
| 40 | 29.5 |
| 50 | 32.4 |
| 60 | 35.2 |
| 70 | 38.2 |
| 80 | 41.2 |
| 90 | 44.8 |
| 97 | 48.0 |
| **100** | **50.0** |
| 97 | 52.8 |
| 90 | 54.9 |
| | AB + A |
| 80E | 56.8 |
| | A |
| 90 | 57.7 |
| 100 | 58.9 |
| 110 | 60.3 |
| 120 | 62.0 |
| 130 | 64.0 |
| 140 | 66.6 |
| 150 | 69.6 |
| 160 | 73.2 |
| 170 | 78.0 |
| 180 | 84.0 |
| 194 | 100 |

B = $C_6H_4BrNO_2$ *m*-Bromonitrobenzene (96)

| | |
|---|---|
| | B |
| 54.7 | 0 |
| 51 | 9.5 |
| | B + AB |
| 47E | 16.9 |
| | AB |
| 50 | 18.0 |
| 60 | 22.2 |
| 70 | 26.5 |
| 80 | 30.9 |
| 90 | 35.4 |
| 100 | 40.2 |
| 110 | 45.8 |
| 113 | 47.7 |
| **116** | **50.0** |
| 113 | 52.5 |
| 107 | 54.6 |
| | AB + A |
| 97E | 57.6 |
| | A |
| 110 | 59.6 |
| 120 | 61.5 |
| 130 | 63.6 |
| 140 | 66.1 |
| 150 | 69.2 |
| 160 | 73.2 |

B = $C_6H_4BrNO_2$.— (*Continued*)

| °C | Mol % A |
|---|---|
| | A |
| 170 | 78.0 |
| 180 | 84.0 |
| 190 | 92.3 |
| 194 | 100 |

B = $C_6H_4BrNO_2$ *p*-Bromonitrobenzene (96)

| | |
|---|---|
| | B |
| 124.5 | 0 |
| 117 | 10.8 |
| 111 | 18.1 |
| 105 | 24.5 |
| | B + AB |
| 99E | 30.2 |
| | AB |
| 110 | 33.9 |
| 120 | 37.6 |
| 130 | 41.5 |
| 140 | 46.2 |
| 143 | 47.8 |
| **145** | **50.0** |
| 143 | 52.9 |
| 140 | 54.6 |
| 130 | 58.5 |
| 120 | 61.2 |
| | AB + A |
| 113E | 62.7 |
| | A |
| 120 | 63.6 |
| 130 | 65.5 |
| 140 | 67.7 |
| 150 | 70.5 |
| 160 | 73.8 |
| 170 | 78.0 |
| 180 | 84.0 |
| 190 | 92.3 |
| 194 | 100 |

B = $C_6H_4ClNO_2$ *o*-Chloronitrobenzene (96)

| | |
|---|---|
| | B |
| 32.5 | 0 |
| 27 | 11.8 |
| 21 | 18.4 |
| | B + AB |
| 15E | 23.1 |
| | AB |
| 25 | 25.8 |
| 35 | 28.8 |
| 45 | 31.9 |
| 55 | 35.2 |
| 65 | 38.7 |
| 75 | 42.6 |
| 85 | 47.4 |
| **89** | **50.0** |
| 85 | 52.8 |
| 77 | 55.7 |
| | AB + A |
| 69E | 58.5 |

B = $C_6H_4ClNO_2$.— (*Continued*)

| °C | Mol % A |
|---|---|
| | A |
| 90 | 59.7 |
| 110 | 61.9 |
| 130 | 64.5 |
| 150 | 69.0 |
| 170 | 75.6 |
| 175 | 77.6 |
| 194 | 100.0 |

B = $C_6H_4ClNO_2$ *m*-Chloronitrobenzene (96)

| | |
|---|---|
| | B |
| 44.5 | 0 |
| 40 | 12.4 |
| 36 | 19.0 |
| | B + AB |
| 50E | 23.8 |
| | AB |
| 60 | 27.7 |
| 70 | 31.8 |
| 80 | 36.0 |
| 90 | 40.7 |
| 100 | 46.0 |
| **104** | **50.0** |
| 100 | 52.7 |
| 90 | 56.6 |
| | AB + A |
| 81E | 59.8 |
| | A |
| 100 | 61.3 |
| 120 | 63.9 |
| 140 | 67.7 |
| 160 | 73.4 |
| 194 | 100 |

B = $C_6H_4ClNO_2$ *p*-Chloronitrobenzene (96)

| | |
|---|---|
| | B |
| 83.5 | 0 |
| 78 | 8.3 |
| 73 | 14.6 |
| | B + AB |
| 68E | 19.5 |
| | AB |
| 80 | 25.1 |
| 90 | 30.0 |
| 100 | 35.0 |
| 110 | 40.2 |
| 120 | 45.8 |
| 124 | 48.1 |
| **126** | **50.0** |
| 124 | 51.9 |
| 120 | 54.1 |
| 110 | 57.2 |
| 100 | 60.3 |
| | AB + A |
| 94E | 62.1 |
| | A |
| 110 | 63.0 |
| 125 | 64.4 |
| 140 | 66.7 |
| 155 | 70.2 |

B = $C_6H_4ClNO_2$.— (*Continued*)

| °C | Mol % A |
|---|---|
| **A** | |
| 170 | 75.3 |
| 180 | 80.0 |
| 185 | 83.8 |
| 190 | 89.5 |
| 193 | 95.6 |
| 194 | 100 |

B = $C_6H_5NO_2$ (96)
Nitrobenzene

| | |
|---|---|
| **B** | |
| **5.5** | 0.0 |
| 4 | 4.1 |
| **B + $AB_2$** | |
| 2E | 9.5 |
| **$AB_2$** | |
| 10 | 13.5 |
| 15 | 16.8 |
| 20 | 21.1 |
| **$AB_2$ + AB** | |
| 25.5U | 28.8 |
| **AB** | |
| 35 | 30.2 |
| 45 | 32.4 |
| 55 | 34.7 |
| 65 | 37.5 |
| 75 | 41.1 |
| 85 | 45.9 |
| 88 | 47.7 |
| **90** | **50.0** |
| 88 | 51.7 |
| 82 | 53.6 |
| 72 | 56.0 |
| 62 | 57.8 |
| **AB + A** | |
| 52E | 59.6 |
| **A** | |
| 70 | 60.8 |
| 90 | 62.1 |
| 110 | 63.8 |
| 130 | 65.9 |
| 160 | 70.7 |
| 180 | 78.7 |
| 194 | 100.0 |

B = $C_6H_6$ (92)

| | |
|---|---|
| **A** | |
| 17 | 0.12 |
| 80 | 0.72 |

B = $C_7H_5ClO$ (97)
Benzoyl chloride

| | |
|---|---|
| **B** | |
| − 0.5 | 0.0 |
| − 4.0 | 8.3 |
| **B + AB** | |
| − 7.5E | 13.3 |
| **AB** | |
| 0.0 | 14.7 |
| +20.0 | 19.6 |
| 40.0 | 26.0 |
| 60.0 | 34.2 |
| 70.0 | 38.7 |
| 80.0 | 43.5 |
| 90.0 | 48.3 |
| **93.0** | **50.0** |

B = $C_7H_5ClO$.— (*Continued*)

| °C | Mol % A |
|---|---|
| **AB** | |
| 90.0 | 51.8 |
| 80.0 | 54.2 |
| 70.0 | 56.2 |
| 60.0 | 58.2 |
| 40.0 | 62.2 |

B = $C_7H_7NO_2$ (96)
*o*-Nitrotoluene

| | |
|---|---|
| **B** | |
| − 8.5 | 0 |
| **B + $AB_2$** | |
| − 9.3E | 1 |
| **$AB_2$** | |
| 0 | 1.6 |
| +10 | 2.6 |
| 20 | 4.1 |
| 30 | 6.6 |
| 40 | 11.2 |
| 50 | 21.0 |
| **$AB_2$ + AB** | |
| 55U | 31.4 |
| **AB** | |
| 70 | 36.3 |
| 85 | 42.4 |
| 95 | 47.5 |
| **99.5** | **50.0** |
| 90 | 53.5 |
| 70 | 57.4 |
| **AB + A** | |
| 45E | 62.1 |
| **A** | |
| 70 | 63.1 |
| 95 | 65.0 |
| 120 | 68.7 |
| 145 | 74.1 |
| 170 | 81.9 |
| 180 | 86.4 |
| 185 | 89.7 |
| 190 | 94.4 |
| 194 | 100 |

B = $C_7H_7NO_2$ (96)
*m*-Nitrotoluene

| | |
|---|---|
| **B** | |
| 16 | 0 |
| **B + $AB_2$** | |
| 13E | 7.9 |
| **$AB_2$** | |
| 20 | 9.9 |
| 27 | 13.6 |
| 34 | 20.8 |
| **$AB_2$ + AB** | |
| 35U | 24.8 |
| **AB** | |
| 50 | 29.5 |
| 65 | 34.5 |
| 80 | 40.2 |
| 90 | 44.8 |
| 95 | 47.4 |
| **99.5** | **50.0** |
| 90 | 53.5 |
| 70 | 57.4 |
| **AB + A** | |
| 45E | 62.1 |

B = $C_7H_7NO_2$.— (*Continued*)

| °C | Mol % A |
|---|---|
| **A** | |
| 70 | 63.1 |
| 95 | 65.0 |
| 120 | 68.7 |
| 130 | 70.7 |
| 194 | 100 |

B = $C_7H_7NO_2$ (96)
*p*-Nitrotoluene

| | |
|---|---|
| **B** | |
| 52.5 | 0 |
| 47 | 9.3 |
| 42 | 15.2 |
| **B + AB** | |
| 37E | 19.2 |
| **AB** | |
| 50 | 23.9 |
| 65 | 29.5 |
| 80 | 35.3 |
| 95 | 41.9 |
| 105 | 46.9 |
| **109** | **50.0** |
| 105 | 52.4 |
| 100 | 54.1 |
| 80 | 58.9 |
| 60 | 62.3 |
| **AB + A** | |
| 45E | 64.6 |
| **A** | |
| 75 | 67.0 |
| 105 | 70.0 |
| 135 | 73.9 |
| 165 | 80.4 |
| 180 | 86.3 |
| 190 | 91.4 |
| 194 | 100 |

B = $C_7H_8$ (92)

| | |
|---|---|
| **A** | |
| 17 | 0.26 |
| 73 | 0.92 |

B = $C_{13}H_{10}O$ (98)
Benzophenone

| | |
|---|---|
| **B** | |
| 48 | 0 |
| 44 | 11.3 |
| **B + AB** | |
| 39.5E | 20 |
| **AB** | |
| 50 | 22.3 |
| 60 | 24.5 |
| 70 | 27.0 |
| 80 | 29.8 |
| 90 | 32.9 |
| 100 | 36.3 |
| 110 | 40 |
| 120 | 44.4 |
| 125 | 46.6 |
| **130** | **50** |
| 125 | 53.3 |
| 120 | 54.5 |
| 110 | 56.5 |
| 100 | 58.1 |
| 90 | 59.5 |

B = $C_{13}H_{10}O$.— (*Continued*)

| °C | Mol % A |
|---|---|
| **AB** | |
| 80 | 60.9 |
| 70 | 62.2 |
| **AB + A** | |
| 60E | 63.5 |
| **A** | |
| 80 | 64.2 |
| 100 | 65.3 |
| 120 | 66.9 |
| 130 | 68.1 |
| 140 | 69.9 |
| 150 | 72.1 |
| 160 | 74.9 |
| 170 | 78.4 |
| 180 | 83.3 |
| 185 | 87.1 |
| 190 | 91.7 |
| 192 | 94.8 |
| 194 | 100.0 |

$AlBr_3$
B = $CBr_4$ (47, 53)

| °C | Mol % B |
|---|---|
| *α*-A | |
| 97.1 | 0.0 |
| 96.6 | 1.0 |
| 94.5 | 2.7 |
| 85.7 | 11.5 |
| 72.5 | 23.0 |
| *β*-A | |
| 68.5 | 29.5 |
| 56.7 | 42.5 |
| 52.3 | 47.6 |
| 50.2 | 49.5 |
| 44.0 | 55.9 |
| *β*-B | |
| 44.7 | 66.1 |
| 46.1 | 67.6 |
| *α*-B | |
| 51.7 | 73.7 |
| 68.8 | 85.5 |
| 77.6 | 90.3 |
| 90.1 | 100.0 |

B = $C_2H_4Br_2$ (99)
Ethylene bromide

| °C | Mol % A |
|---|---|
| **B** | |
| 10 | 0 |
| 6 | 8.4 |
| + 2 | 16.0 |
| **B + A** | |
| − 2E | 22.9 |
| **A** | |
| +10 | 28.4 |
| 20 | 33.9 |
| 30 | 40.1 |
| 40 | 47.2 |
| 50 | 55.1 |
| 60 | 63.6 |
| 70 | 72.7 |
| 80 | 82.3 |
| 90 | 92.2 |
| 96 | 100 |

B = $C_6H_4BrNO_2$
*o*-Bromonitrobenzene (91)

| °C | Mol % A |
|---|---|
| **B** | |
| 38 | 0 |
| 30 | 15.7 |
| **B + AB** | |
| 21E | 24.4 |
| **AB** | |
| 30 | 27.9 |
| 40 | 31.4 |
| 50 | 34.9 |
| 60 | 38.6 |
| 70 | 42.3 |
| 80 | 46.1 |
| **88.5** | **50.0** |
| 80 | 52.9 |
| 70 | 55.2 |
| 60 | 57.5 |
| 50 | 60.0 |
| 40 | 62.4 |
| 30 | 64.9 |
| **AB + A** | |
| 24E | 66.3 |
| **A** | |
| 30 | 67.7 |
| 40 | 70.0 |
| 50 | 72.2 |
| 60 | 74.9 |
| 70 | 77.9 |
| 80 | 82.6 |
| 85 | 85.5 |
| 90 | 89.6 |
| 93 | 92.9 |
| 96 | 100 |

B = $C_6H_4BrNO_2$
*m*-Bromonitrobenzene (91)

| | |
|---|---|
| **B** | |
| 54 | 0.0 |
| 50 | 9.0 |
| **B + AB** | |
| 45.5E | 15.5 |
| **AB** | |
| 60 | 20.6 |
| 80 | 28.1 |
| 110 | 42.6 |
| 120 | 48.6 |
| **122** | **50.0** |
| 120 | 50.9 |
| 100 | 57.6 |
| 80 | 63.0 |
| 60 | 68.5 |
| **AB + A** | |
| 42E | 73.7 |
| **A** | |
| 60 | 75.6 |
| 80 | 80.9 |
| 90 | 88.8 |
| 93 | 92.2 |
| 96 | 100 |

B = $C_6H_4BrNO_2$
*p*-Bromonitrobenzene (91)

| °C | Mol % A |
|---|---|
| **B** | |
| 124.5 | 0 |
| 119 | 7.8 |
| 115 | 15.0 |
| 110 | 20.3 |
| 105 | 24.8 |
| 100 | 28.1 |
| **B + AB** | |
| 98E | 29.2 |
| **AB** | |
| 110 | 33.2 |
| 120 | 37.2 |
| 130 | 41.7 |
| 140 | 46.8 |
| **144** | **50.0** |
| 140 | 52.5 |
| 130 | 56.2 |
| 120 | 58.9 |
| 80 | 65.7 |
| 60 | 68.4 |
| 50 | 69.9 |
| **AB + A** | |
| 45E | 70.6 |
| **A** | |
| 50 | 71.9 |
| 60 | 74.7 |
| 70 | 78.3 |
| 80 | 82.9 |
| 85 | 85.9 |
| 90 | 90.5 |
| 93 | 94.5 |
| 96 | 100 |

B = $C_6H_4ClNO_2$
*o*-Chloronitrobenzene (91)

| | |
|---|---|
| **B** | |
| 32.5 | 0.0 |
| 30 | 7.1 |
| 25 | 14.1 |
| 20 | 19.6 |
| 15 | 24.8 |
| **B + AB** | |
| 13.8E | 26.1 |
| **AB** | |
| 30 | 30.8 |
| 40 | 34.1 |
| 50 | 37.4 |
| 60 | 40.8 |
| 70 | 44.2 |
| 80 | 48.5 |
| **83.5** | **50.0** |
| 80 | 51.4 |
| 70 | 54.2 |
| 60 | 57.0 |
| 50 | 59.6 |
| 40 | 62.2 |
| 30 | 64.8 |
| **AB + A** | |
| 21 | 67.0 |
| **A** | |
| 40 | 71.1 |
| 50 | 73.4 |

**$AlBr_3$.—(*Cont'd*)**

**B = $C_6H_4ClNO_2$.—(*Continued*)**

| °C | Mol % A |
|---|---|
| | A |
| 60 | 75.8 |
| 70 | 78.2 |
| 90 | 89.3 |
| 93 | 93.2 |
| 96 | 100 |

**B = $C_6H_4ClNO_2$**
*m*-Chloronitrobenzene (91)

| | |
|---|---|
| | B |
| 44.5 | 0.0 |
| 42.0 | 8.7 |
| 40.0 | 12.0 |
| 38.0 | 15.0 |
| | B + AB |
| 35.5E | 18.5 |
| | AB |
| 40.0 | 20.0 |
| 50.0 | 23.9 |
| 60.0 | 28.0 |
| 70.0 | 32.3 |
| 80 | 36.7 |
| 90 | 41.4 |
| 100 | 47.0 |
| **103.5** | **50.0** |
| 100.0 | 52.2 |
| 90 | 56.3 |
| 80 | 59.5 |
| 60 | 64.4 |
| 50 | 66.8 |
| | AB + A |
| 40E | 69.0 |
| | A |
| 50 | 70.9 |
| 60 | 73.0 |
| 70 | 75.7 |
| 80 | 79.7 |
| 85 | 82.8 |
| 90 | 87.3 |
| 93 | 92.0 |
| 96 | 100.0 |

**B = $C_6H_4ClNO_2$**
*p*-Chloronitrobenzene (91)

| | |
|---|---|
| | B |
| 83 | 0 |
| 80 | 5.5 |
| 70 | 16.3 |
| | B + AB |
| 60E | 25.4 |
| | AB |
| 70 | 29.2 |
| 80 | 33.0 |
| 90 | 37.3 |
| 100 | 41.7 |
| 110 | 47.1 |
| **115** | **50.0** |
| 110 | 52.0 |
| 100 | 54.3 |
| 80 | 57.5 |
| 60 | 60.8 |
| 40 | 64.0 |

**B = $C_6H_4ClNO_2$.—(*Continued*)**

| °C | Mol % A |
|---|---|
| | AB + A |
| 20E | 67.2 |
| | A |
| 40 | 72.4 |
| 60 | 77.4 |
| 70 | 80.0 |
| 80 | 83.1 |
| 90 | 88.9 |
| 93 | 92.5 |
| 96 | 100.0 |

**B = $C_6H_5NO_2$ (91)**
Nitrobenzene

| | |
|---|---|
| | B |
| + 5.5 | 0.0 |
| 0 | 9.2 |
| − 5 | 15.7 |
| −10 | 20.8 |
| | B + AB |
| −15E | 25.0 |
| | AB |
| 0 | 26.7 |
| +20 | 29.6 |
| 30 | 31.3 |
| 40 | 33.0 |
| 50 | 35.1 |
| 70 | 40.5 |
| 80 | 44.6 |
| 85 | 47.3 |
| **87** | **50.0** |
| 85 | 51.8 |
| 70 | 55.0 |
| 60 | 56.6 |
| 50 | 58.3 |
| 40 | 60.0 |
| | AB + A |
| 20E | 63.3 |
| | A |
| 30 | 65.8 |
| 40 | 68.3 |
| 50 | 70.8 |
| 70 | 76.2 |
| 80 | 80.1 |
| 93 | 92.9 |
| 96 | 100 |

**B = $C_6H_6$ (92)**

| | |
|---|---|
| | B |
| 5.7 | 0 |
| 4.5 | 3.2 |
| 3.0 | 6.8 |
| | A + B |
| 1.8 | 9.9 |
| | A |
| 10 | 13.5 |
| 20 | 20.4 |
| 30 | 29.6 |
| 40 | 40.4 |
| 50 | 50.0 |
| 60 | 58.5 |
| 70 | 67.1 |
| 80 | 75.8 |
| 90 | 85.5 |
| 94 | 91.9 |

**B = $C_7H_5ClO$ (97)**
Benzoyl chloride

| °C | Mol % A |
|---|---|
| | B |
| − 0.5 | 0 |
| − 2.5 | 6.5 |
| | B + AB |
| − 5E | 13 |
| | AB |
| +10 | 17.4 |
| 30 | 24.6 |
| 50 | 31.8 |
| 70 | 40 |
| 80 | 44.3 |
| 85 | 47 |
| **90** | **50** |
| 80 | 52.8 |
| 60 | 56 |
| 40 | 59.5 |
| 20 | 63.1 |
| | AB + A |
| 7E | 65.5 |
| | A |
| 20 | 67.9 |
| 40 | 72.6 |
| 60 | 79.4 |
| 70 | 83.9 |
| 80 | 89.2 |
| 90 | 95.8 |
| 96 | 100 |

**B = $C_7H_7NO_2$ (91)**
*o*-Nitrotoluene

| | |
|---|---|
| | B |
| − 8.5 | 0.0 |
| −10.0 | 3.5 |
| | B + $AB_2$ |
| −11.0E | 4.6 |
| | $AB_2$ |
| 0 | 5.4 |
| +10 | 7.0 |
| 20 | 10.0 |
| 30 | 14.5 |
| 40 | 23.9 |
| | $AB_2$ + AB |
| 42.5U | 32.1 |
| | AB |
| 60 | 37.8 |
| 75 | 43.0 |
| 85 | 46.7 |
| **90** | **50.0** |
| 85 | 53.2 |
| 80 | 54.6 |
| 70 | 56.5 |
| 55 | 59.3 |
| 40 | 62.1 |
| | AB + A |
| 19E | 66.1 |
| | A |
| 40 | 70.6 |
| 55 | 74.3 |
| 70 | 78.3 |
| 80 | 81.7 |
| 85 | 84.4 |
| 90 | 88.5 |
| 93 | 92.2 |
| 96 | 100.0 |

**B = $C_7H_7NO_2$ (91)**
*m*-Nitrotoluene

| °C | Mol % A |
|---|---|
| | B |
| 16 | 0.0 |
| 12 | 7.5 |
| 8 | 12.5 |
| 4 | 17.0 |
| | B + AB |
| 1E | 20.0 |
| | AB |
| 20 | 24.8 |
| 40 | 30.5 |
| 60 | 36.5 |
| 80 | 43.0 |
| 90 | 46.9 |
| **96** | **50.0** |
| 90 | 53.2 |
| 80 | 55.4 |
| 60 | 59.2 |
| 40 | 63.0 |
| | AB + A |
| 27E | 65.8 |
| | A |
| 40 | 70.0 |
| 60 | 76.6 |
| 70 | 80.3 |
| 80 | 84.8 |
| 85 | 87.4 |
| 90 | 91.3 |
| 93 | 94.7 |
| 96 | 100.0 |

**B = $C_7H_7NO_2$ (91)**
*p*-Nitrotoluene

| | |
|---|---|
| | B |
| 53.5 | 0.0 |
| 50.0 | 5.4 |
| 45.0 | 12.5 |
| 40 | 18.9 |
| 35 | 24.5 |
| | B + AB |
| 29E | 30.5 |
| | AB |
| 50 | 36.6 |
| 70 | 42.8 |
| 80 | 46.6 |
| **88** | **50.0** |
| 70 | 55.2 |
| 50 | 60.3 |
| | AB + A |
| 27E | 65.8 |
| | A |
| 50 | 71.7 |
| 70 | 78.6 |
| 85 | 85.8 |
| 93 | 93.7 |
| 96 | 100.0 |

**B = $C_7H_8$ (92)**

| | |
|---|---|
| | A |
| −15 | 6.7 |
| −10 | 7.1 |
| 0 | 9.7 |
| +10 | 14.0 |
| 20 | 20.3 |

**B = $C_7H_8$.—(*Cont'd*)**

| °C | Mol % A |
|---|---|
| | A |
| 30 | 30.4 |
| 40 | 43.0 |
| 50 | 52.9 |
| 60 | 61.3 |
| 70 | 70.0 |
| 80 | 78.5 |
| 90 | 88.5 |
| 94 | 93.9 |
| 96 | 100.0 |

**B = $C_8H_{10}$ (92)**
*p*-Xylene

| | |
|---|---|
| | B |
| 14 | 0 |
| 12.5 | 4.8 |
| | A + B |
| 10.2E | 11.8 |
| | A |
| 20 | 18.1 |
| 30 | 26.5 |
| 40 | 38.5 |
| 50 | 50.7 |
| 60 | 60.8 |
| 80 | 78.3 |
| 90 | 89.2 |
| 94 | 94.7 |
| 96 | 100.0 |

**B = $C_{13}H_{10}O$ (98)**
Benzophenone

| | |
|---|---|
| | B |
| 48 | 0 |
| 45 | 8.5 |
| 42 | 13.8 |
| | B + AB |
| 38E | 18.3 |
| | AB |
| 50 | 21 |
| 60 | 23.4 |
| 70 | 25.7 |
| 80 | 28.1 |
| 90 | 30.6 |
| 100 | 33.4 |
| 110 | 36.3 |
| 120 | 39.6 |
| 130 | 43.2 |
| 140 | 48.4 |
| **142** | **50** |
| 140 | 52.1 |
| 130 | 54.5 |
| 120 | 56.7 |
| 110 | 58.6 |
| 100 | 60.3 |
| 90 | 61.7 |
| 80 | 62.9 |
| 70 | 64.1 |
| 60 | 65.1 |
| 50 | 66.0 |
| | AB + A |
| 38E | 67.2 |
| | A |
| 50 | 70.7 |
| 60 | 74.2 |
| 70 | 78.3 |

**B = $C_{13}H_{10}O$.—(*Continued*)**

| °C | Mol % A |
|---|---|
| | A |
| 80 | 83.3 |
| 85 | 86.7 |
| 90 | 90.7 |
| 93 | 94.8 |
| 96 | 100 |

**$MgBr_2$**

**B = $CH_2O_2$ (90)**
Formic acid

| | |
|---|---|
| | $AB_6$ |
| 0 | 6.37 |
| 20 | 6.96 |
| 40 | 8.12 |
| 60 | 9.22 |
| 70 | 10.18 |
| 80 | 11.60 |
| 86 | 13.28 |
| **88** | **14.33** |

**B = $CH_4N_2O$ (94)**
Urea

| | |
|---|---|
| | B |
| 132 | 0.00 |
| 126 | 1.40 |
| 120 | 2.56 |
| 114 | 3.29 |
| | B + $AB_6$ |
| 108.5E | 3.69 |
| | $AB_6$ |
| 115 | 4.62 |
| 120 | 5.51 |
| 125 | 6.71 |
| 127 | 7.22 |
| 130m | 10.16 |
| | $AB_6$ + $AB_4$ |
| 130U | 9.90 |
| | $AB_4$ |
| 145 | 10.42 |
| 160 | 11.86 |
| 165 | 12.79 |
| 170 | 15.68 |
| 171 | 18.86 |
| | **20.00** |

**B = $CH_4O$ (87)**
Methyl alcohol

| | |
|---|---|
| | $AB_6$ |
| 0 | 4.37 |
| 20 | 4.63 |
| 40 | 4.89 |
| 60 | 5.18 |
| 80 | 5.51 |
| 100 | 6.07 |
| 110 | 6.46 |
| 120 | 6.85 |
| 130 | 7.36 |
| 140 | 7.81 |
| 150 | 8.34 |
| 160 | 9.00 |
| 170 | 9.77 |
| 180 | 10.9 |
| 185 | 11.6 |
| **190** | **14.3** |

**B = $C_2H_4O_2$ (90)**
Acetic acid

| °C | Mol % A |
|---|---|
| | $AB_6$ |
| 17 | 0.033 |
| 30 | 0.166 |
| 50 | 0.50 |
| 60 | 0.89 |
| 70 | 1.86 |
| 80 | 4.66 |
| 85 | 6.17 |
| 90 | 7.32 |
| 100 | 9.5 |
| 105 | 10.80 |
| 110 | 12.44 |
| **112** | **14.3** |

**B = $C_2H_5NO$ (93)**
Acetamide

| | |
|---|---|
| | B |
| 82 | 0.0 |
| 70 | 2.5 |
| 60 | 3.67 |
| | B + $AB_6$ |
| 50.5E | 7.06 |
| | $AB_6$ |
| 70 | 7.32 |
| 90 | 7.73 |
| 110 | 7.98 |
| 130 | 9.41 |
| 150 | 10.77 |
| 160 | 11.72 |
| 165 | 12.52 |
| **169** | **14.3** |

**B = $C_2H_6O$ (87)**
Ethyl alcohol

| | |
|---|---|
| | $AB_6$ |
| 0 | 1.82 |
| 10 | 2.70 |
| 20 | 3.60 |
| 30 | 4.58 |
| 40 | 5.55 |
| 50 | 6.58 |
| 60 | 7.66 |
| 70 | 8.67 |
| 75 | 9.05 |
| 80 | 9.78 |
| 85 | 9.90 |
| 90 | 10.3 |
| 95 | 10.9 |
| 100 | 11.7 |
| 103 | 12.3 |
| 106 | 13.2 |
| **108.5** | **14.3** |

**B = $C_3H_6O$ (89)**
Acetone

| | |
|---|---|
| | $AB_3$ |
| 0 | 0.033 |
| 30 | 0.13 |
| 60 | 0.24 |
| 70 | 0.33 |
| 72 | 0.61 |
| 73 | 0.91 |
| 74 | 2.40 |
| 75 | 9.85 |
| 76 | 15.5 |

**B = $C_3H_6O$.—** *(Continued)*

| °C | Mol % A |
|---|---|
| | $AB_3$ |
| 80 | 19.1 |
| 84 | 21.3 |
| 88 | 23.1 |
| **92** | **25.0** |

**B = $C_3H_7NO_2$ (94)**
Urethane

| | |
|---|---|
| | B |
| 49 | 0.00 |
| 45 | 3.17 |
| 39 | 6.45 |
| | B + $AB_6$ |
| 35E | 7.73 |
| | $AB_6$ |
| 50 | 8.19 |
| 70 | 9.30 |
| 80 | 10.30 |
| 85 | 11.03 |
| 90 | 12.45 |
| **91.5m** | **14.33** |
| | $AB_6$ + $AB_4$ |
| 91 | 13.10 |
| | $AB_4$ |
| 100 | 13.95 |
| 110 | 15.38 |
| 115 | 16.30 |
| 120 | 17.65 |
| **123** | **20.00** |

**B = $C_3H_8O$ (87)**
*n*-Propyl alcohol

| | |
|---|---|
| | $AB_6$ |
| 0 | 10.40 |
| 10 | 11.05 |
| 20 | 11.62 |
| 30 | 12.31 |
| 40 | 12.80 |
| 43 | 12.95 |
| 46 | 13.20 |
| 48 | 13.56 |
| 50 | 13.80 |
| **52** | **14.33** |

**B = $C_3H_8O$ (87)**
Isopropyl alcohol

| | |
|---|---|
| | $AB_4$ |
| 0 | 6.58 |
| 20 | 6.81 |
| 40 | 7.11 |
| 60 | 8.01 |
| 80 | 8.92 |
| 100 | 10.10 |
| 110 | 10.82 |
| 120 | 11.85 |
| 130 | 13.36 |
| 136 | 15.7 |
| 138 | 17.3 |
| **139** | **20.0** |

**B = $C_3H_8O_2$ (89)**
Methylal

| | |
|---|---|
| | $AB_2$ |
| 20 | 0.66 |
| 40 | 1.04 |
| 60 | 1.36 |
| 80 | 1.70 |
| 100 | 2.03 |

**B = $C_3H_8O_2$.—** *(Continued)*

| °C | Mol % A |
|---|---|
| | $AB_2$ + two liquid phases |
| 106 | 2.49-27.2 |
| | $AB_2$* |
| 108 | 29.0 |
| 110 | 31.2 |
| **112** | **33.3** |
| | AB |
| 74.7 | 21.5 |
| 107.0 | 33.3 |
| 120.0 | |
| | $A_3B$ |
| 94.7 | 31.0 |
| 95.2 | 31.1 |
| | $AB_2$ (144, 147) |
| 18.5 | 5.9 |
| 18.8 | 6.7 |
| 39.5 | 10.2 |
| 52.0 | 14.1 |
| 74.5 | 21.4 |
| 83.0m | 25.0 |
| 87.0m | 27.0 |
| | $AB_2$ + $A_xB_y$ |
| 91mU | 30 |
| | $A_xB_y$ |
| 108 | 33.1 |
| 115.5 | 35.1 |
| 130 | 38.5 |
| 137 | 41.0 |
| 142 | 43.2 |
| 143.5 | 44.0 |
| | $A_xB_y$ + $A_3B_2$ |
| 145 | 45 |
| | $A_3B_2$ |
| 159 | 47.5 |
| 173 | 52.8 |
| 180 | 60.0 |

* $AB_2$ + $AB_3$, 94.7°U.

**B = $C_4H_6O_3$ (93)**
Acetic anhydride

| | |
|---|---|
| | $AB_6$ |
| 0 | 3.49 |
| 30 | 3.97 |
| 60 | 5.02 |
| 90 | 5.97 |
| 120 | 7.86 |
| 130 | 9.62 |
| 135 | 11.9 |
| **136.5** | **14.3** |

**B = $C_4H_{10}O$ (87)**
Isobutyl alcohol

| | |
|---|---|
| | $AB_6$ |
| 0 | 7.44 |
| 10 | 7.97 |
| 20 | 8.68 |
| 30 | 9.41 |
| 40 | 10.10 |
| 50 | 10.73 |
| 60 | 11.33 |
| 65 | 12.67 |
| 71 | 12.29 |
| 75 | 12.98 |
| 77 | 13.36 |
| **80** | **14.33** |

**B = $C_4H_{10}O$ (87)**
*tert.*-Butyl alcohol

| °C | Mol % A |
|---|---|
| | $AB_4$ |
| 24.4 | 0.0093 |
| 25 | 0.15 |
| 35 | 1.50 |
| 45 | 3.10 |
| 55 | 5.36 |
| 60 | 6.89 |
| 65 | 8.80 |
| 70 | 11.25 |
| 75 | 14.39 |
| 77.5 | 15.96 |
| 79 | 17.85 |
| **80** | **20.00** |

**B = $C_4H_{10}O$**
Ethyl ether (85, 86)

| | |
|---|---|
| | $AB_2$ |
| − 8 | 0.242 |
| 0 | 0.324 |
| +10 | 0.515 |
| 14 | 0.666 |
| 16 | 0.786 |
| 18 | 0.938 |
| 20 | 1.10 |
| 22 | 1.32 |
| | $AB_2$ + two liquid phases |
| 22.8 | 1.42–20.5 |
| | $AB_2$ |
| 23 | 21.2 |
| 24 | 22.4 |
| 26 | 24.1 |
| 28.5 | 26.0 |
| | $AB_2$ + AB |
| 30 | 26.6 |
| | Two liquid phases |
| −10m | 0.75 22.5 |
| 0m | 0.94 21.8 |
| +10m | 1.14 21.2 |
| 20m | 1.36 20.6 |
| 30 | 1.56 20.2 |
| 40 | 1.75 19.9 |
| 50 | 1.95 19.6 |
| 60 | 2.12 19.5 |
| 70 | 2.24 19.6 |
| 80 | 2.33 19.8 |
| 90 | 2.38 19.9 |
| 100 | 2.41 20.1 |
| 120 | 2.33 20.7 |
| 140 | 2.12 21.3 |
| 158 | 1.75 21.9 |
| | AB |
| 170 | 0.05 |
| 162 | 0.12 |
| 159 | 0.56 |
| 158 | 1.36 |
| 158 | 1.60 |
| | AB + two liquid phases |
| 158 | 1.75–21.9 |
| | AB |
| 140 | 22.3 |
| 120 | 22.9 |
| 100 | 23.5 |
| 80 | 24.2 |

**B = $C_4H_{10}O$.—** *(Continued)*

| °C | Mol % A |
|---|---|
| | AB |
| 60 | 25.1 |
| 40 | 26.1 |
| 30 | 26.6 |
| 20m | 27.1 |
| 0m | 28.1 |

**B = $C_5H_{12}O$ (87)**
Isoamyl alcohol

| | |
|---|---|
| | $AB_6$ |
| 0 | 9.57 |
| 10 | 10.38 |
| 20 | 11.12 |
| 30 | 11.78 |
| 35 | 12.03 |
| 38 | 12.45 |
| 40 | 12.65 |
| 42 | 13.0 |
| 44 | 13.3 |
| **46** | **14.33** |

**B = $C_6H_7N$ (88)**
Aniline

| | |
|---|---|
| | $AB_6$ |
| 10 | 0.538 |
| 30 | 0.628 |
| 50 | 0.872 |
| 70 | 1.27 |
| 90 | 2.18 |
| 100 | 3.22 |
| 103.5m | 4.82 |
| | $AB_6$ + $AB_4$ |
| 103U | 4.17 |
| | $AB_4$ |
| 120 | 4.23 |
| 140 | 4.30 |
| 160 | 4.53 |
| 180 | 4.97 |
| 200 | 5.92 |
| 220 | 8.14 |
| 230 | 10.10 |
| | $AB_4$ + $AB_2$ |
| 237U | 14.59 |
| | $AB_2$ |
| 250 | 14.80 |
| 260 | 15.00 |
| 270 | 15.14 |

**B = $C_6H_8N_2$ (88)**
Phenylhydrazine

| | |
|---|---|
| | $AB_6$ |
| 20 | 0.39 |
| 40 | 0.92 |
| 60 | 2.16 |
| 80 | 4.41 |
| | $AB_6$ + $AB_4$ |
| 99U | 7.49 |
| | $AB_4$ |
| 140 | 8.37 |
| 180 | 9.46 |
| 200 | 10.19 |

**B = $C_7H_6O$ (89)**
Benzaldehyde

| | |
|---|---|
| | $AB_3$ |
| 0 | 0.15 |
| 30 | 0.26 |

**B = $C_7H_6O$.—** *(Continued)*

| °C | Mol % A |
|---|---|
| | $AB_3$ |
| 60 | 0.40 |
| 80 | 0.53 |
| 100 | 0.72 |
| 120 | 1.28 |
| 130 | 2.03 |
| 140 | 3.87 |
| 145 | 7.90 |
| 146 | 15.3 |
| 148 | 20.3 |
| 153 | 23.0 |
| **159** | **25.0** |

**B = $C_8H_9NO$ (93)**
Acetanilide

| | |
|---|---|
| | B |
| 112 | 0.0 |
| 110 | 0.52 |
| 108 | 1.05 |
| | B + $AB_6$ |
| 107.5E | 1.23 |
| | $AB_6$ |
| 140 | 2.65 |
| 170 | 4.09 |
| 185 | 5.39 |
| 195 | 6.83 |
| 200 | 8.33 |
| 205 | 10.3 |
| **209** | **14.3** |

## $MgI_2$

**B = $CH_4O$ (87)**
Methyl alcohol

| | |
|---|---|
| | $AB_6$ |
| 0 | 4.55 |
| 20 | 4.96 |
| 40 | 5.14 |
| 60 | 5.68 |
| 80 | 6.03 |
| 100 | 6.44 |
| 120 | 6.88 |
| 140 | 7.44 |
| 160 | 8.05 |
| 180 | 8.80 |
| 200 | 9.74 |
| | **14.3** |

**B = $C_2H_3N$ (93)**
Acetonitrile

| | |
|---|---|
| | $AB_6$ |
| 0 | 3.49 |
| 30 | 5.03 |
| 50 | 6.20 |
| 70 | 7.68 |
| 80 | 9.18 |
| 89 | 12.18 |
| | $AB_6$ + $AB_{6-x}$ |
| | **14.30** |

**B = $C_2H_4O_2$ (90)**
Acetic acid

| | |
|---|---|
| | $AB_6$ |
| 20 | 0.0562 |
| 40 | 0.285 |
| 60 | 0.478 |
| 70 | 0.925 |
| 75 | 1.28 |

### $MgI_2$.—(*Cont'd*)

$B = C_2H_4O_2$.—(*Continued*)

| °C | Mol % A |
|---|---|
| | $AB_6$ |
| 80 | 1.86 |
| 85 | 2.80 |
| 95 | 4.62 |
| 105 | 6.28 |
| 115 | 7.86 |
| 125 | 9.29 |
| 135 | 11.25 |
| 140 | 13.05 |
| **142** | **14.3** |

### $B = C_2H_5NO$ (93)

Acetamide

| B | |
|---|---|
| 82 | 0.0 |
| 70 | 2.90 |
| 58 | 5.20 |
| $B + AB_6$ | |
| 49E | 6.56 |
| $AB_6$ | |
| 80 | 7.60 |
| 110 | 8.72 |
| 130 | 9.62 |
| 150 | 10.71 |
| 160 | 11.35 |
| 170 | 12.35 |
| 175 | 13.45 |
| **177** | **14.3** |

### $B = C_2H_6O$ (87)

Ethyl alcohol

| $AB_6$ | |
|---|---|
| 0 | 2.01 |
| 20 | 3.21 |
| 40 | 4.54 |
| 60 | 5.97 |
| 80 | 7.47 |
| 100 | 9.04 |
| 110 | 9.75 |
| 120 | 10.52 |
| 130 | 11.44 |
| 135 | 12.02 |
| 140 | 12.75 |
| 143 | 13.38 |
| 145 | 13.8 |
| **146.5** | **14.3** |

### $B = C_3H_6O$ (89)

Acetone

| $AB_6$ | |
|---|---|
| 0 | 0.46 |
| 30 | 0.64 |
| 50 | 0.79 |
| 60 | 0.98 |
| 70 | 1.47 |
| 80 | 2.59 |
| 85 | 4.32 |
| 90 | 7.02 |
| 95 | 10.3 |
| 100 | 12.7 |
| 105 | 13.9 |
| **106.5** | **14.3** |

### $B = C_2H_6O_2$ (93)

Ethyl formate

| °C | Mol % A |
|---|---|
| | $AB_6$ |
| 0 | 1.62 |
| 10 | 1.88 |
| 20 | 2.23 |
| 30 | 2.76 |
| 40 | 3.59 |
| 50 | 5.13 |
| 60 | 8.64 |
| **70.5** | **14.3** |

### $B = C_3H_6O_2$ (93)

Methyl acetate

| $AB_6$ | |
|---|---|
| 0 | 0.040 |
| 30 | 0.056 |
| 60 | 0.077 |
| 90 | 0.094 |
| 100 | 0.18 |
| $AB_6$ + two liquids | |
| 103 | 0.25–9.6 |
| $AB_6$ | |
| 110 | 10.85 |
| 120 | 13.88 |
| **121** | **14.3** |

### $B = C_3H_7NO_2$

Urethane (94)

| B | |
|---|---|
| 49 | 0.0 |
| 45 | 3.23 |
| 39 | 5.51 |
| $B + AB_6$ | |
| 32E | 6.48 |
| $AB_6$ | |
| 50 | 7.53 |
| 70 | 9.27 |
| 80 | 10.60 |
| 84 | 11.61 |
| **87** | **14.3** |
| $AB_{(6-x)}$ | |
| | <14.3 |

### $B = C_3H_8O$ (87)

Isopropyl alcohol

| $AB_6$ | |
|---|---|
| 10 | 6.67 |
| 30 | 7.11 |
| 50 | 7.60 |
| 70 | 8.17 |
| 90 | 8.84 |
| 110 | 9.69 |
| 120 | 10.25 |
| 130 | 11.25 |
| 136 | 12.58 |
| **138** | **14.30** |

### $B = C_4H_8O_2$ (93)

Ethyl acetate

| $AB_6$ | |
|---|---|
| 0 | 0.35 |
| 20 | 0.53 |
| 40 | 0.96 |
| 50 | 1.55 |
| 55 | 2.48 |
| 60 | 4.56 |
| 65 | 8.16 |
| 70 | 12.54 |

### $B = C_4H_8O_2$.—(*Continued*)

| °C | Mol % A |
|---|---|
| | $AB_6$ |
| 75 | 13.85 |
| **78.5** | **14.3** |

### $B = C_4H_{10}O$ (85)

Ethyl ether

| $AB_2$ | |
|---|---|
| 5.4 | 0.39 |
| 11.8 | 0.66 |
| 15.6 | 0.95 |
| 18.1 | 1.50 |
| 20.4 | 2.12 |
| 22.2 | 3.28 |
| $AB_2$ + two liquids | |
| 23.6 | 4.33–12.85 |
| $AB_2$ | |
| 24.5 | 19.57 |
| 26 | 21.1 |
| 28 | 21.6 |
| 31.5 | 24.2 |
| 35.5 | 26.4 |
| 40.5 | 27.3 |
| 45 | 29.45 |
| 50 | 32.45 |
| 51 | 33.0 |
| Two liquid phases | |
| 15m | 12.9 |
| 17m | 12.8 |
| 18.5m | 4.02 12.8 |
| 25 | 4.34 12.8 |
| 32 | 4.84 12.8 |
| 35 | 5.34 12.7 |
| **37** | 5.88 12.1 |
| 38 | 6.46 11.5 |
| 38.5 | 8.58 8.58 |

### $B = C_5H_{10}O_2$ (93)

Propyl acetate

| $AB_6$ | |
|---|---|
| 0 | 0.473 |
| 20 | 0.625 |
| 30 | 0.755 |
| 35 | 0.906 |
| 40 | 2.255 |
| 45 | 5.79 |
| 50 | 9.70 |
| 55 | 12.22 |
| 60 | 13.57 |
| **65** | **14.3** |

### $B = C_6H_7N$ (88)

Aniline

*See* Fig. 14, p. 213

### $B = C_6H_{12}O_2$ (93)

Isobutyl acetate

| $AB_6$ | |
|---|---|
| 0 | 1.27 |
| 20 | 1.32 |
| 40 | 2.16 |
| 50 | 2.51 |
| 60 | 3.09 |
| 70 | 4.25 |
| 75 | 5.17 |
| 80 | 6.78 |
| 85 | 12.5 |
| **87.5** | **14.3** |

### $B = C_8H_{14}O_2$ (89)

Acetal

| $AB_2$ | |
|---|---|
| 20 | 0.034 |
| 60 | 0.104 |
| $AB_2$ + two liquid phases | |
| 77 | 0.140–29.6 |
| $AB_2$ | |
| 79 | 30.4 |
| 81 | 31.2 |
| 83 | 31.6 |
| **86** | **33.3** |

### $B = C_7H_6O$ (89)

Benzaldehyde

| $AB_6$ | |
|---|---|
| 0 | 0.38 |
| 20 | 0.45 |
| 40 | 0.62 |
| 60 | 0.92 |
| 80 | 1.36 |
| 100 | 2.25 |
| 110 | 3.34 |
| 120 | 5.06 |
| 125 | 6.91 |
| 130 | 10.2 |
| 133 | 12.1 |
| 136 | 13.5 |
| **139** | **14.3** |

### $B = C_7H_{14}O_2$ (93)

Isoamyl acetate

| $AB_6$ | |
|---|---|
| 0 | 0.96 |
| 20 | 1.43 |
| 40 | 2.64 |
| 45 | 3.25 |
| 50 | 4.28 |
| 55 | 6.29 |
| 57.5 | 8.49 |
| **60** | **14.3** |

## $CaCl_2$

### $B = CH_4O$ (87)

Methyl alcohol

| $AB_4$ | |
|---|---|
| 0 | 5.9 |
| 10 | 6.8 |
| 20 | 7.8 |
| 30 | 8.85 |
| 40 | 10.0 |
| 50 | 11.4 |
| $AB_4 + AB_3$ | |
| 55U | 12.2 |
| $AB_3$ | |
| 75 | 12.9 |
| 95 | 13.7 |
| 115 | 14.9 |
| 135 | 16.6 |
| 155 | 18.4 |
| 165 | 20.1 |
| 170 | 21.0 |
| 174 | 22.5 |
| $AB_3 + AB$(?) | |
| 177U | 25.0 |

### $B = CH_4O$.—(*Continued*)

| °C | Mol % A |
|---|---|
| | AB(?) |
| 190 | 26.6 |
| 215 | 28.3 |

### $B = C_2H_4O_2$ (90)

Acetic acid

| B | |
|---|---|
| 16.2 | 0.0 |
| 15.0 | 3.83 |
| 14 | 5.85 |
| 13 | 7.48 |
| $B + AB_3$ | |
| 11.1E | 9.58 |
| $AB_3$ | |
| 30 | 10.7 |
| 35 | 11.3 |
| 40 | 12.5 |
| 45 | 14.6 |
| 50 | 16.3 |
| 60 | 19.0 |
| 65 | 20.6 |
| 70 | 22.3 |
| **73** | **25.0** |

### $B = C_2H_6O$ (87)

Ethyl alcohol

| $AB_3$ | |
|---|---|
| 0 | 7.6 |
| 20 | 9.7 |
| 40 | 13.3 |
| 60 | 16.6 |
| 70 | 18.9 |
| 80 | 20.8 |
| 85 | 21.5 |
| 90 | 22.3 |
| 95 | 23.8 |
| **97** | **25.0** |

## $CaBr_2$

### $B = C_2H_6O$ (19.5)

Ethyl alcohol

| °C | g A per g B |
|---|---|
| | $AB_4$ |
| 0 | 0.4670 |
| 10 | 0.4801 |
| 15 | 0.5051 |
| $AB_4 + AB_3$ | |
| 17E | |
| $AB_3$ | |
| 20 | 0.5350 |
| 25 | 0.5395 |
| 30 | 0.5552 |
| 40 | 0.6011 |
| 50 | 0.6564 |
| 60 | 0.7602 |
| 70 | 0.9381 |
| $AB_3 + AB$ | |
| 73.9E | |
| AB | |
| 75 | 1.0220 |
| 80 | 1.0310 |
| 85 | 1.0610 |

## $Ca(CHO_2)_2$

Formate

### $B = CH_2O_2$ (51)

Formic acid

### $B = CH_2O_2$.—(*Continued*)

| °C | Mol % A |
|---|---|
| | B |
| 8.4 | 0.0 |
| 8.1 | 0.16 |
| 7.7 | 0.48 |
| 7.4 | 0.71 |
| 7.2 | 0.93 |
| 6.9 | 1.27 |
| 6.6 | 1.53 |
| | A |
| 30 | 1.61 |
| 35 | 1.54 |
| 45 | 1.35 |
| 49.7 | 1.26 |
| 61.0 | 1.10 |
| 79.0 | 0.83 |
| 100.0 | 0.57 |
| 128.6 | 0.39 |

## $BaBr_2$

### $B = C_2H_6O$ (19.5)

Ethyl alcohol

| °C | g A/g B |
|---|---|
| | A |
| 0 | 0.05880 |
| 10 | 0.05067 |
| 15 | 0.04590 |
| 20 | 0.04130 |
| 30 | 0.03322 |
| 40 | 0.02437 |
| 50 | 0.01833 |
| 60 | 0.01479 |
| 70 | 0.01253 |

## $BaBaI_2$

### $B = C_2H_6O$ (19.5)

Ethyl alcohol

| A | |
|---|---|
| 0 | 0.7775 |
| 10 | 0.7735 |
| 20 | 0.7700 |
| 30 | 0.7660 |
| 40 | 0.7620 |
| 50 | 0.7585 |
| 60 | 0.7550 |
| 70 | 0.7510 |

## $Ba(CHO_2)_2$

Formate

### $B = CH_2O_2$ (51)

Formic acid

| °C | Mol % A |
|---|---|
| | B |
| 8.4 | 0.0 |
| 7.2 | 0.91 |
| 6.1 | 1.74 |
| 5.1 | 2.30 |
| 2.6 | 3.73 |
| + 0.5 | 4.67 |
| − 0.3 | 5.12 |
| $B + A$ | |
| − 4.9E | 6.95 |
| A | |
| + 9.5 | 8.52 |
| 15.5 | 8.86 |
| 19.0 | 9.23 |
| 24.9 | 9.83 |

B = $CH_2O_2$.— (*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 26.5 | 10.03 |
| 31.8 | 10.75 |

## LiCl

B = $C_2H_6O$ (151)
Ethyl alcohol

| °C | Mol % A |
|---|---|
| $AB_4$ | |
| 0 | 13.5 |
| 5 | 14.1 |
| 10 | 15.5 |
| 15 | 16.9 |
| 17 | 18.1 |
| $AB_4$ + A | |
| 17.4U | 20.7 |
| A | |
| 20 | 20.8 |
| 30 | 21.5 |
| 40 | 21.6 |
| 50 | 21.0 |
| 60 | 20.3 |

B = $C_9H_7N$ (161)
Quinoline

| °C | Mol % A |
|---|---|
| $AB_2$ | |
| 0 | 0.459 |
| 25 | 1.067 |
| 40 | 1.845 |
| 45 | 3.060 |
| 50 | 3.280 |
| 56.4 | 3.460 |
| 67 | 3.635 |
| 75 | 2.430 |
| 96 | 1.380 |

## LiBr

B = $C_2H_6O$ (19.5)
Ethyl alcohol

## $LiCHO_2$

Formate
B = $CH_2O_2$ (51)
Formic acid

| °C | Mol % A |
|---|---|
| B | |
| 8.4 | 0.0 |
| 7.0 | 1.58 |
| 5.2 | 3.47 |
| 3.2 | 5.33 |
| + 1.1 | 7.09 |
| − 1.3 | 8.93 |
| − 3.5 | 10.75 |
| − 5.6 | 12.23 |
| − 8.2 | 13.99 |
| −14.6 | 18.19 |
| −17.1 | 19.56 |
| −19.8 | 21.25 |
| −23.5m | 23.49 |
| −25.0m | 24.33 |
| B + A | |
| −21.7E | 22.24 |
| A | |
| +18.0 | 23.49 |
| 34.0 | 23.93 |
| 80.0 | 25.31 |
| 90.5 | 25 91 |

B = $CH_2O_2$.— (*Continued*)

| °C | Mol % A |
|---|---|
| A | |
| 97.9 | 26.38 |
| 113.1 | 27.71 |
| 131.2 | 29.87 |
| 145.1 | 31.98 |
| 150.4 | 33.04 |
| 159.1 | 35.01 |
| 163.5 | 36.13 |

## NaBr

B = $C_2H_6O$ (19.5)
Ethyl alcohol

| °C | g A per g B |
|---|---|
| A | |
| 0 | 0.02445 |
| 10 | 0.02379 |
| 15 | 0.02343 |
| 20 | 0.02322 |
| 25 | 0.02314 |
| 30 | 0.02292 |
| 40 | 0.02276 |
| 50 | 0.02259 |
| 60 | 0.02312 |
| 70 | 0.02345 |

## NaI

B = $C_2H_6O$ (22, 41, 151)
Ethyl alcohol

| °C | Mol % A |
|---|---|
| A? | |
| 10 | 11.85 |
| 30 | 11.98 |
| 50 | 12.02 |
| 80 | 12.12 |
| 100 | 12.18 |
| 120 | 12.20 |
| 160 | 12.12 |
| 180 | 11.97 |
| 200 | 11.45 |
| 220 | 10.70 |
| 230 | 9.54 |
| 240 | 9.10 |
| 250 | 7.45 |
| 255 | 6.20 |
| 260 | 3.19 |
| 261.5 crit. | 2.57 |

If the alcohol content exceeds $m$ = 365 g $l^{-1}$ the tube is completely filled below the crit. temp. At this point the curve displays a sharp change in direction. For alcohol content below $m$, complete vaporization takes place below the crit. temp. and the curve goes over sharply into the sol. curve for the vapor.

B = $C_6H_6O$.— (*Continued*)

Mol % A in vapor containing $m_B$ g $l^{-1}$ of B

| $m_B$ | 262° | 270° | 280° |
|---|---|---|---|
| A | | | |
| 1 | 0.153 | 0.153 | 0.153 |
| 2 | 0.642 | 0.642 | 0.642 |
| 3 | 1.54 | 1.54 | 1.51 |
| 3.65 | 2.57 | 2.53 | 2.42 |
| 4 | 3.44 | 3.41 | 3.27 |
| 4.5 | 5.04 | 4.95 | 4.83 |
| 4.8 | 6.21 | | |

| $m_B$ | 290° | 300° | 310° |
|---|---|---|---|
| 1 | 0.153 | 0.153 | 0.153 |
| 2 | 0.642 | 0.642 | 0.642 |
| 3 | 1.48 | 1.45 | 1.425 |
| 3.65 | 2.40 | 2.31 | 2.25 |
| 4 | 3.12 | 3.04 | 2.90 |

B = $C_3H_6O$ (78)
Acetone

## $NaCHO_2$

Formate
B = $CH_2O_2$ (51)
Formic acid

| °C | Mol % A |
|---|---|
| B | |
| 8.4 | 0.0 |
| 7.5 | 1.04 |
| 5.3 | 2.92 |
| 3.0 | 4.61 |
| + 0.4 | 6.35 |
| − 3.8 | 8.72 |
| − 7.6 | 10.50 |
| B + $AB_2$ | |
| −12.8E | 12.58 |
| $AB_2$ | |
| −17.4 | 14.52 |
| + 0.3 | 16.45 |
| 10.7 | 18.18 |
| 22.9 | 20.69 |
| 24.4 | 21.13 |
| 26.3 | 21.86 |
| 30.5 | 23.23 |
| 33.1 | 24.43 |
| 34.5 | 24.91 |
| $AB_2$ + AB | |
| 36U | 25.7 |
| AB | |
| 31.0m | 25.18 |
| 37.3 | 25.90 |
| 45.2 | 27.00 |
| 45.6 | 27.10 |
| 52.2 | 28.39 |
| 59.0 | 29.80 |
| 65.1 | 31.15 |
| 67.5 | 31.65 |
| 69.6 | 32.14 |
| AB + A | |
| 72U | 33.3 |
| A | |
| 45.1m | 29.80 |
| 63.6m | 31.65 |
| 81.2 | 33.40 |
| 99.3 | 35.71 |
| 118.6 | 39.10 |
| 135.2 | 42.79 |

B = $CH_2O_2$.— (*Continued*)

| °C | Mol % A |
|---|---|
| 137.7 | 43.47 |

## $NaC_2H_3O_2$

Acetate
B = $C_2H_4O_2$ (51)
Acetic acid

| | |
|---|---|
| B | |
| 16.5 | 0.0 |
| 16.1 | 0.83 |
| 14.3 | 3.59 |
| B + $AB_2$ | |
| 13.1E | 5.40 |
| $AB_2$ | |
| 25.3 | 7.11 |
| 36.7 | 8.92 |
| 54.3 | 12.17 |
| 66.9 | 15.27 |
| 71.9 | 16.58 |
| 85.7 | 21.55 |
| 93.2 | 26.86 |
| 96.1 | 30.22 |
| 96.25 | 33.03 |
| $AB_2$ + AB | |
| 96.3U | 33.33 |
| AB | |
| 112.0 | 34.03 |
| 132.3 | 36.87 |
| 145.2 | 39.06 |
| 157.0 | 42.54 |
| 160.6 | 44.25 |
| 162.3 | 46.28 |
| AB + A | |
| 164U | 48 |
| A | |
| 174.4 | 48.76 |
| 195.5 | 49.49 |

## $NaC_{16}H_{31}O_2$

Palmitate
B = $C_{16}H_{32}O_2$ (30)
Palmitic acid
*See* Fig. 15, p. 213

## KI

B = $CH_4O$ (22, 25, 39, 152, 157, 158)
Methyl alcohol
*See* Fig. 16,* p. 213

* As can be seen from Fig. 16, the data of different authors fall into three groups. The lowest solubility corresponds to (152); the highest to (25). The data of five different authorities over a slight temperature interval, arranged in a mean curve, give a somewhat greater solubility than (152). Different water content may be responsible for this discrepancy.

## $KCHO_2$

Formate
B = $CH_2O_2$ (51)
Formic acid

| °C | Mol % A |
|---|---|
| B | |
| 8.4 | 0.0 |
| 7.4 | 0.97 |
| 4.9 | 3.02 |
| + 2.3 | 4.73 |
| − 0.9 | 6.36 |
| − 5.7 | 8.43 |
| −12.6 | 10.74 |
| −18.7 | 12.63 |
| −23.8 | 13.88 |
| B + $AB_3$(?) | |
| −31.5 E | 15.57 |
| $AB_3$(?) | |
| −29.0 | 16.32 |
| −27.3 | 16.62 |
| −23.5 | 17.44 |
| −21.7 | 18.10 |
| −19.5 | 18.88 |
| $AB_3$ + $AB_2$ | |
| −18U | 19.5 |

B = $CH_2O_2$.— (*Continued*)

| °C | Mol % A |
|---|---|
| $AB_2$ | |
| −19.0 | 19.44 |
| −16.0 | 19.91 |
| − 8.0 | 21.21 |
| − 0.6 | 22.79 |
| $AB_2$ + AB | |
| + 5U | 24 |
| AB | |
| −10.1m | 23.04 |
| + 7.3 | 24.14 |
| 29.9 | 25.90 |
| 53.0 | 28.56 |
| 65.1 | 30.41 |
| 72.9 | 31.97 |
| 80.6 | 33.74 |
| 93.0 | 37.29 |
| 96.1 | 38.34 |
| 103.2 | 41.68 |
| 104.3 | 42.63 |
| 104.6 | 42.91 |
| 107.5 | 45.95 |
| **108.6** | **50.00** |
| 108.2 | 51.49 |
| 107.2 | 54.24 |
| 103.4 | 58.47 |
| 101.6 | 61.14 |
| AB + A | |
| 98.7E | 63.14 |
| A | |
| 108.1 | 66.45 |
| 114.0 | 68.71 |
| 122.3 | 71.24 |
| 130.7 | 75.18 |
| 135.8 | 77.75 |
| 143.6 | 82.41 |
| 150.0 | 86.68 |
| 157.3 | 91.24 |
| 167.5 | 100.0 |

## KCNS

B = $C_5H_5N$ (60, 156)
Pyridine
*See* Fig. 17, p. 213

### Part II. Fragmentary Data

For arrangement, *v.* p. 185

In the few cases where the investigator has definitely determined the exact nature of the solid phase present, this is indicated by "c" following the formula of the crystalline phase, or by "crys." Supersaturation with respect to another crystalline phase (usually some compound between solvent and solute) is indicated by the letter "m." Critical solution temperatures are marked "c."

For convenience in use all values where possible have been reduced to Mol %, even though such reduction involves a possible loss in accuracy in instances where reliable density data were not available. For possibly more accurate values in volume units, and for other values at the same or other temperatures, the reader should therefore consult the literature cited.

B = $CCl_4$, Carbon tetrachloride

| A = solute | °C | Mol % A | Lit. |
|---|---|---|---|
| $SnI_4$ | 22.4 | 1.345 | (74) |
| | 50 | 3.37 | (74) |
| $HgCl_2$ | 19 | 0.0011 | (147) |
| $HgBr_2$ | 19 | 0.00128 | (147) |

B = $CCl_4$, Carbon tetrachloride.—(*Continued*)

| A = solute | °C | Mol % A | Lit. |
|---|---|---|---|
| $HgI_2$ | 19 | 0.0203 | (147) |
| $HgI_2$ (yellow) | 75 | 0.0319 | (147) |
| $Hg(CN)_2$ | 19 | 0.00061 | (147) |
| $OsO_4$ | 20 | 0.155 | (162) |

Ca soaps of various fats, *v.* (138)

B = $CS_2$, Carbon disulfide

Ca soaps of various fats (138)

B = $CHCl_3$, Chloroform

| | | | |
|---|---|---|---|
| $NH_4Cl$ | 25 | 0.0 | (130) |
| $NH_4Br$ | 25 | 0.0 | (130) |
| $SnI_4$ | 28 | 1.68 | (74) |
| $HgCl_2$ | 19 | 0.047 | (147) |
| $HgBr_2$ | 19 | 0.0418 | (147) |
| $HgI_2$ | 20 | 0.0105 | (29) |
| $HgI_2$ (yellow and red) | 61 | 0.0427 | (147) |

B = $CHBr_3$, Bromoform

| | | | |
|---|---|---|---|
| $HgCl_2$ | 19 | 0.451 | (147) |
| $HgBr_2$ | 19 | 0.475 | (147) |
| $HgI_2$ | 19 | 0.270 | (147) |
| $Hg(CN)_2$ | 19 | 0.00501 | (147) |

B = $CH_2O_2$, Formic acid

| | | | |
|---|---|---|---|
| $Zn(CHO_2)_2$(c) | 140 | 0.16 | (51) |
| $Cu(CHO_2)_2$(c) | 140 | 0.10 | (51) |
| $Ni(CHO_2)_2$(c) | 140 | 0.10 | (51) |
| $Mg(CHO_2)_2$(c) | 25 | 0.20 | (51) |

B = $CH_3NO_2$, Nitromethane

| | | | |
|---|---|---|---|
| LiI | 0 | 0.481 | (157) |
| | 25 | 0.997 | (157) |
| NaI | 0 | 0.120 | (157) |
| | 25 | 0.169 | (157) |
| KI | 0–25 | 0.115 | (157) |
| RbI | 0 | 0.142 | (157) |
| | 25 | 0.133 | (157) |

B = $CH_4O$, Methyl alcohol

| | | | |
|---|---|---|---|
| $NH_4NO_3$ | 20 | 6.40 | (22) |
| $NH_4Cl$ | 25 | 2.074 | (22, 41) |
| $NH_4ClO_4$ | 25 | 1.83 | (164) |
| $NH_4Br$ | 25 | 4.025 | (22, 41) |
| $Pb(NO_3)_2$ | 20.5 | 0.132 | (22) |
| $ZnSO_4$ | 18 | 0.13 | (22) |
| $ZnSO_4.7H_2O$ | 17m | 6.15m | (22) |
| $CdCl_2$ | 15.5 | 0.300 | (22) |
| $CdI_2$ | 20 | 16.3 | (150) |
| $HgBr_2$ | 25 | 5.82 | (39) |
| $HgI_2$ | 25 | 0.23 | (232, 39) |
| $HgI_2$ (yellow) | 36 | 0.456 | (147) |
| $Hg(CN)_2$ | 25 | 5.61 | (22, 39) |
| $CuCl_2$ | 22 | 12.2 | (32) |
| | 60 | 12.5 | (32) |
| $CuSO_4$ | 18m | 0.211m | (22) |
| $CuSO_4.5H_2O$ | 3.5m | 1.685m | (22) |
| | 18 | 1.965 | (22) |
| AgCl | Room | $8.1 \times 10^{-13}$ | (123) |
| AgBr | Room | $4.4 \times 10^{-15}$ | (123) |
| AgI | Room | $6.1 \times 10^{-18}$ | (123) |
| $AgNO_3$ | 19 | 0.67 | (22) |
| $Pt_x(NO_2)_y(C_aH_bS_c)_z$ | 25 | *v.* Lit. | (27) |
| $CoSO_4$ | 18m | 0.216m | (22) |
| $CoSO_4.7H_2O$ | 3.5 | 4.65m | (22) |
| | 18.5 | 5.86 | (22) |
| $NiSO_4$ | 18 | 0.104 | (22) |

B = $CH_4O$, Methyl alcohol.—(*Continued*)

| A = solute | °C | Mol % A | Lit. |
|---|---|---|---|
| $NiSO_4.6H_2O$ | 18.5 | 3.70 | (22) |
| $NiSO_4.7H_2O$(c) | 4 | 2.74m | (22) |
| | 20 | 5.38 | (22) |
| $(UO_2)(NO_3)_2.6H_2O$ | 11 | 0.27 | (125) |
| $Mg(ClO_4)_2$ | 25 | 6.92 | (164) |
| $MgSO_4$ | 18m | 0.312m | (22) |
| $MgSO_4.7H_2O$ | 3.5 | 3.64 | (22) |
| | 17m | 4.95m | (22) |
| $Ca(ClO_4)_2$ | 25 | 35.3 | (164) |
| $Ca(NO_3)_2$(c) | 25m | 27.0 | (29) |
| $SrCl_2.6H_2O$ | 6.5 | 7.04 | (22) |
| $Sr(ClO_4)_2$ | 25 | 19.2 | (164) |
| $Sr(NO_3)_2$(c) | 25 | 0.193 | (29) |
| $BaCl_2$ | 15.5 | 0.335 | (22) |
| $BaCl_2.2H_2O$ | 6–7 | 0.95 | (22) |
| $Ba(ClO_4)_2$ | 25 | 17.11 | (164) |
| $BaBr_2$ | 240.7c | 0.044 | (25) |
| $BaBr_2.2H_2O$ | 9 | 4.04 | (22) |
| | 15 | 4.20 | (22) |
| $Ba(NO_3)_2$ | 25 | 0.062 | (29) |
| LiCl | 1 | 4.0 | (62) |
| | 23 | 11.4 | (62, 151) |
| | 50 | 17.6 | (62) |
| $LiClO_4$ | 25 | 35.4 | (164) |
| $LiClO_4.3H_2O$ | 25 | 23.8 | (164) |
| LiI(c) | 25 | 42.0 | (151) |
| NaCl | 19.5 | 0.76 | (22) |
| NaCl(c) | 25 | 0.71 | (41, 151) |
| | 241.1c | 0.55 | (25) |
| $NaClO_4$ | 25 | 11.82 | (164) |
| NaBr | 25 | 5.43 | (22, 41) |
| | 245c | 0.28 | (25) |
| NaI (crys. $AB_3$) | 25 | 16.2 | (22, 41, 151) |
| $NaNO_2$ | 19.5 | 2.01 | (22) |
| $NaNO_3$ | 20 and 25 | 0.155 | (22) |
| 1, 3, 4-$C_6H_3(NO_2)_2ONa.H_2O$ | 25 | 0.98 | (33) |
| KCl | 25 | 0.226 | (22, 39, 151) |
| | 240c | 0.0 | (25) |
| $KClO_3$ | 0 | 0.0145 | (13) |
| | 20 | 0.025 | (13) |
| $KClO_4$ | 25 | 0.0243 | (164) |
| KBr | 25 | 0.573 | (22, 39, 151) |
| | 241.2c | 0.54 | (25) |
| KCN | 19.5 | 2.36 | (22) |
| 1, 3, 4-$C_6H_3(NO_2)_2OK$ | 25 | 0.52 | (33) |
| RbCl | 25 | 0.372 | (151) |
| $RbClO_4$ | 25 | 0.0104 | (164) |
| $CsClO_4$ | 25 | 0.0128 | (164) |

B = $C_2Cl_4$, Tetrachloroethylene

| | | | |
|---|---|---|---|
| $HgCl_2$ | 25 | 0.00443 | (45) |

B = $C_2HCl_3$, Trichloroethylene

| | | | |
|---|---|---|---|
| $HgCl_2$ | 25 | 0.0133 | (45) |

B = $C_2HCl_5$, Pentachloroethane

| | | | |
|---|---|---|---|
| $HgCl_2$ | 25 | 0.0144 | (45) |

B = $C_2H_2Cl_2$, Dichloroethylene

| A = solute | °C | Mol % A | Lit. |
|---|---|---|---|
| $HgCl_2$ | 25 | 0.040 | (45) |
| $HgI_2$ (yellow and red) | 85.5 | 0.261 | (147) |

B = $C_2H_2Cl_4$, Tetrachloroethane

| | | | |
|---|---|---|---|
| $HgCl_2$ | 25 | 0.0537 | (45) |

B = $C_2H_3N$, Methyl cyanide

| | | | |
|---|---|---|---|
| $Hg(CN)_2$ | 18 | 1.54 | (121) |
| $CuCl_2$ | 18 | 0.491 | (121) |
| $Cu_2Cl_2$ | 18 | 2.69 | (121) |
| $CuBr_2$ | 18 | 4.33 | (121) |
| $Cu_2Br_2$ | 18 | 0.55 | (121) |
| $Cu_2I_2$ | 18 | 0.38 | (121) |
| $AgNO_3$ | 18 | 41.4 | (121) |
| $CoCl_2$(crys. $AB_2$) | 18 | 1.27 | (121) |
| NaI | 0 | 0.117 | (157) |
| | 25 | 0.163 | (157) |
| KI | 0 | 0.569 | (157) |
| | 25 | 0.502 | (157) |

B = $C_2H_4Br_2$, Ethylene bromide

| | | | |
|---|---|---|---|
| $HgCl_2$ | 19 | 1.047 | (147) |
| $HgBr_2$ | 19 | 1.20 | (147) |
| $HgI_2$ | 19 | 0.308 | (147) |
| $Hg(CN)_2$ | 19 | 0.00074 | (147) |

B = $C_2H_5I$, Ethyl iodide

| | | | |
|---|---|---|---|
| $HgI_2$ | 19 | 0.699 | (147) |

B = $CH_4N_2O$, Urea

$NH_4NO_3$ Eutectic at 46.9°C and 48.27 Mol % A (155)

B = $C_2H_3N$, Methyl cyanide

| | | | |
|---|---|---|---|
| $NH_4CNS$ | 18 | 3.90 | (121) |
| KCNS | 18 | 4.56 | (121) |
| RbI | 0 | 0.36 | (157) |
| | 25 | 0.33 | (157) |

B = $C_2H_4O_2$, Acetic acid

| | | | |
|---|---|---|---|
| $Zn(C_2H_3O_2)_2$(c) | 130 | 0.10 | (51) |
| $Fe(C_2H_3O_2)_3$ | 140 | 0.0 | (51) |
| $Ca(C_2H_3O_2)_2$(c) | 30 | 0.35 | (51) |

B = $C_2H_4O_2$, Methyl formate

| | | | |
|---|---|---|---|
| $HgI_2$ (yellow and red) | 37 | 0.154 | (147) |

B = $C_2H_3Cl$, Chloroethylene

| | | | |
|---|---|---|---|
| $HgCl_2$ | 25 | 0.45 | (45) |

B = $C_2H_5Br$, Ethyl bromide

| | | | |
|---|---|---|---|
| $HgCl_2$ | 19 | 0.802 | (147) |
| $HgBr_2$ | 19 | 0.697 | (147) |
| $HgI_2$ | 19 | 0.154 | (147) |
| $HgI_2$ (red) | 38 | 0.185 | (147) |
| $Hg(CN)_2$ | 19 | 0.00561 | (147) |

B = $C_2H_6O$, Ethyl alcohol

| | | | |
|---|---|---|---|
| $NH_4Cl$ | 25 | 0.579 | (22, 41) |
| $NH_4ClO_4$ | 25 | 0.744 | (164) |
| $NH_4Br$ | 25 | 1.515 | (22, 41) |
| | 78 | 4.70 | (31) |
| $NH_4NO_3$ | 20 | 2.16 | (22) |
| $BiI_3$ | 20 | 0.283 | (37) |
| $Pb(NO_3)_2$ | 20.5 | 0.0056 | (22) |
| $CdCl_2$ | 15.5 | 0.382 | (22) |
| | 244.6c | 0.382 | (25) |
| $CdBr_2.4H_2O$ | 15 | 3.42 | (31) |
| $CdX_2(C_{20}H_{21}NO_4.HX)_2$. (X = halogen) | Papaverines, *v.* | | (166) |
| $HgBr_2$(c) | 25 | 3.69 | (39) |

B = $C_2H_6O$, Ethyl alcohol.—*(Continued)*

| A = solute | °C | Mol % A | Lit. |
|---|---|---|---|
| $HgI_2$ | 25 | 0.225 | (22, 40) |
| $HgI_2$ (yellow) | 78 | 0.436 | (147) |
| $Hg(CN)_2$(c) | 19.5 | 1.81 | (22) |
| | 25 | 1.90 | (39) |
| $CuCl_2$ | 0 | 13.8 | (32) |
| (crys. AB) | 25 | 15.0 | (22, 32, 36) |
| | 50 | 19.6 | (32) |
| $CuSO_4.5H_2O$ | 3 | 0.205 | (22) |
| AgCl | Room | $1.03 \times 10^{-13}$ | (123) |
| AgBr | Room | $3.7 \times 10^{-15}$ | (123) |
| AgI | Room | $6.3 \times 10^{-19}$ | (123) |
| $AgNO_3$ | 19 | 0.83 | (22) |
| $NH_2(CH_3)_2PtCl_6$ | 0 | | (16) |
| $NH(CH_3)_2PtCl_6$ | 0 | | (16) |
| $2Fe_2O_3.5SO_3.18H_2O$, β-Copiapite | 25 | 0.74 | (165) |
| $Fe_2(SO_4)_3.H_2SO_4.8H_2O$ | 25 | 3.34 | (165) |
| $CoCl_2$ | Room | 16.6 | (17) |
| $CoSO_4.7H_2O$ | 3 | 0.40 | (22) |
| $NiSO_4.7H_2O$ | 3 | 0.232 | (22) |
| | 17 | 0.352 | (22) |
| $YtCl_3$ | 20 | 12.8 | (84) |
| $NdCl_3$ | 20 | 7.56 | (84) |
| $Mg(ClO_4)_2$ | 25 | 4.71 | (164) |
| $MgSO_4.7H_2O$ | 3 | 0.245 | (22) |
| $Ca(ClO_4)_2$ | 25 | 35.5 | (164) |
| $Ca(NO_3)_2$ | 25 | 23.2 | (29) |
| $SrCl_2.6H_2O$ | 6.5 | 0.66 | (22) |
| $Sr(ClO_4)_2$ | 25 | 22.5 | (164) |
| $SrI_2$ | −20 | 0.36 | (32) |
| | + 4 | 0.43 | (32) |
| | 82 | 0.60 | (32) |
| $Sr(NO_3)_2$(c) | 25 | 0.0044 | (29) |
| $Ba(ClO_4)_2$ | 25 | 14.56 | (164) |
| $BaBr_2$ | 22.5 | 0.48 | (22) |
| $Ba(NO_3)_2$ | 25 | 0.0009 | (29) |
| $(C_6H_2(NO_2)_3O)_2Ba$, Picrate (crys. $A.5H_2O$) | 25 | 0.54 | (33) |
| $BaC_{14}H_6N_4O_{14}$, 3-5-Dinitrosalicylate | 25 | 0.39 | (33) |
| LiCl | 25 | 21.8 | (151) |
| $LiClO_4$ | 25 | 39.6 | (164) |
| $LiClO_4.3H_2O$ | 25 | 17.25 | (164) |
| LiI(c) | 25 | 46.3 | (151) |
| $C_{11}H_{23}COOLi$, Laurate | 15 | 0.123 | (146) |
| $C_{13}H_{27}COOLi$, Myristate | 15 | 0.0532 | (146) |
| $C_{15}H_{31}COOLi$, Palmitate | 15 | 0.0210 | (146) |
| $C_{17}H_{33}COOLi$, Oleate | 15 | 0.202 | (146) |
| $C_{17}H_{35}COOLi$, Stearate | 15 | 0.0106 | (146) |
| NaCl(c) | 25 | 0.51 | (22, 41, 151) |
| $NaClO_4$ | 25 | 5.22 | (164) |
| NaBr | 25 | 1.63 | (41) |
| | 19.5 | 0.98 | (22) |
| $NaNO_2$ | 19.5 | 0.207 | (22) |
| $NaNO_3$ | 25 | 0.0195 | (22) |
| $CH_3COONa$ | Room | 1.0 | (17) |
| $p$-$NO_2C_6H_4ONa.4H_2O$ | 25 | 1.64 | (33) |
| 1, 3, 4-$C_6H_3(NO_2)_2ONa.H_2O$ | 25 | 0.77 | (33) |
| $C_6H_2(NO_2)_3ONa.H_2O$, Picrate | 0 | 0.63 | (33) |
| | 25 | 1.09 | (33) |

B = $C_2H_6O$, Ethyl alcohol.—(*Continued*)

| A = solute | °C | Mol % A | Lit. |
|---|---|---|---|
| 1, 3, 4-$C_6H_3ClNO_2ONa.H_2O$ | 25 | 0.20 | (33) |
| $Na_2CrO_4$ | 25 | 0.10 | (22) |
| KCl(c) | 25 | 0.0136 | (22, 151) |
| $KClO_3$ | 0 | 0.00176 | (12) |
| | 21 | 0.00300 | (12) |
| $KClO_4$ | 0 | 0.00195 | (12, 13, 149) |
| | 25 | 0.00399 | (164) |
| KBr | 25 | 0.053 | (22, 151) |
| KI | −98 | 0.315 | (124) |
| | 0 | 0.414 | (157) |
| | 25 | 0.564 | (22, 61, 151, 157) |
| KCN | 19.5 | 0.62 | (22) |
| $C_6H_2(NO_2)_3OK$, Picrate | 25 | 0.40 | (33) |
| $C_9H_6IO_2K$, β-Iodocinnamate | 15 | 0.58 | (48) |
| $C_9H_6IO_2K$, β-Iodoallocinnamate | 15 | 2.70 | (48) |
| RbCl | 25 | 0.030 | (151) |
| $RbClO_4$ | 25 | 0.0022 | (164) |
| $CsClO_4$ | 25 | 0.0022 | (164) |
| $Cs_2CO_3$ | 19 | 1.55 | (23) |
| | 80 | 2.76 | (23) |

B = $C_2H_6O_2$, Glycol

| | | | |
|---|---|---|---|
| $CuSO_4.5H_2O$ | 14.6 | 2.01 | (125) |
| $CoCl_2$(c) | 3 | 5.42 | (125) |
| LiCl | 15 | 15.4 | (125) |
| KI | 0.0 | 14.39 | (157) |
| | 25 | 15.55 | (157) |

B = $C_3H_5ClO$, α-Epichlorohydrin

| | | | |
|---|---|---|---|
| $HgI_2$ (yellow and red) | 117 | 1.230 | (147) |

B = $C_3H_5ClO$, Epichlorohydrin

| | | | |
|---|---|---|---|
| $N(CH_3)_4CNS$ | 25 | 0.396 | (159) |

B = $C_3H_5N$, Ethyl cyanide

| | | | |
|---|---|---|---|
| NaI | 0 | 2.65 | (157) |
| | 25 | 1.82 | (157) |
| KI | 0 | 0.143 | (157) |
| | 25 | 0.134 | (157) |
| RbI | 0 | 0.086 | (157) |
| | 25 | 0.099 | (157) |

B = $C_3H_6O$, Acetone

| | | | |
|---|---|---|---|
| $NH_4ClO_4$ | 25 | 1.084 | (164) |
| $SbCl_3$ | 18 | 57.8 | (116) |
| $BiCl_3$ | 18 | 3.21 | (116) |
| $Bi(NO_3)_3$ | 0 | 12.25 | (60) |
| | 19 | 9.55 | (60) |
| $SnCl_2$ | 18 | 14.2 | (116) |
| $SnCl_2.2H_2O$ | 0 | 2.83 | (60) |
| | 35.5 | 2.83 | (60) |
| $ZnCl_2$ | 18 | 15.6 | (116) |
| $CdBr_2$ | 18 | 0.329 | (116) |
| $CdI_2$ | 18 | 3.8 | (116) |
| $HgI_2$ | − 1 | 0.359 | (60) |
| | +18 | 0.428 | (60) |
| | 40 | 0.564 | (60) |
| | 58 | 0.769 | (60, 147) |
| $CuCl_2$ | 18 | 1.23 | (116) |
| | 22 | 0.963 | (125) |
| | 56 | 0.603 | (60) |
| $CuCl_2.2H_2O$ | 0–14 | 2.945 | (60) |
| $AgNO_3$ | 14–60 | 0.12 | (60, 116) |

B = $C_3H_6O$, Acetone.—(*Continued*)

| A = solute | °C | Mol % A | Lit. |
|---|---|---|---|
| $FeCl_3$ | 18 | 18.4 | (116) |
| $CoCl_2$ | 0 | 3.89 | (60) |
| | 22.5 | 3.98 | (60) |
| | 25 | 3.72 | (57, 116) |
| $CoCl_2.2H_2O$ | 0–25 | 5.65 | (60) |
| $(UO_2)(NO_3)_2.6H_2O$ | 12 | 0.176 | (125) |
| $B(OH)_3$ | 20 | 0.47 | (40) |
| $Mg(ClO_4)_2$ | 25 | 10.03 | (164) |
| $Ca(ClO_4)_2$ | 25 | 20.5 | (164) |
| $Ca(NO_3)_2$ | 25 | 33.3 | (29) |
| Ca soaps of various fats, *v.* (138) | | | |
| $Sr(ClO_4)_2$ | 25 | 28.0 | (164) |
| $Sr(NO_3)_2$(c) | 25 | 0.0055 | (29) |
| $Ba(OH)_2$ | 25 | 0.0035 | (40) |
| $Ba(ClO_4)_2$ | 25 | 17.74 | (164) |
| $Ba(NO_3)_2$ | 25 | 0.0011 | (29) |
| LiCl | 0 | 5.93 | (60) |
| | 25 | 5.32 | (60) |
| | 46 | 4.91 | (60) |
| | 58 | 2.85 | (60) |
| $LiClO_4$ | 25 | 42.5 | (164) |
| $LiClO_4.3H_2O$ | 25 | 25.79 | (164) |
| $LiNO_3$ | 18 | 2.53 | (136) |
| NaCl | 20 | 0.0 | (40) |
| $NaClO_4$ | 25 | 19.68 | (164) |
| $C_6H_3(NO_2)_2ONa.H_2O$, 3, 4-Dinitrophenolate | 25 | 0.38 | (33) |
| KCl | 20 | 0.0 | (40) |
| $KClO_4$ | 25 | 0.0652 | (164) |
| KBr | 25 | 0.0098 | (57) |
| KI | 0 | 0.746 | (60, 157) |
| | 25 | 0.459 | (57, 157) |
| | 56 | 0.420 | (60) |
| KCNS | 22 | 11.05 | (60) |
| | 58 | 10.85 | (60) |
| $C_6H_3(NO_2)_2OK$, 3, 4- Dinitrophenolate | 25 | 0.36 | (33) |
| $RbClO_4$ | 25 | 0.0299 | (164) |
| RbI | 0 | 0.33 | (157) |
| | 25 | 0.23 | (157) |
| CsCl | 25 | 0.011 | (35) |
| $CsClO_4$ | 25 | 0.0375 | (164) |

B = $C_3H_6O_2$, Methyl acetate

| | | | |
|---|---|---|---|
| $HgCl_2$ | 18 | 10.4 | (118) |
| $HgBr_2$ | 18 | 4.31 | (118) |
| $HgI_2$ (red) | 58 | 0.405 | (147) |
| $CuCl_2$ | 18 | 0.303 | (118) |
| $CoCl_2$ | 18 | 0.283 | (118) |
| $CoBr_2$ | 18 | 3.35 | (118) |
| $Ca(NO_3)_2$ | 18 | 23.9 | (118) |

B = $C_3H_6O_2$, Ethyl formate

| | | | |
|---|---|---|---|
| $HgI_2$ (red) | 54 | 0.349 | (147) |

B = $C_3H_7OH$, Isopropyl alcohol

| | | | |
|---|---|---|---|
| $HgI_2$ (yellow and red) | 81 | 0.299 | (147) |

B = $C_3H_7OH$, *n*-Propyl alcohol

| | | | |
|---|---|---|---|
| $NH_4Cl$ | 25 | 0.252 | (41) |
| $NH_4ClO_4$ | 25 | 0.197 | (164) |
| $NH_4Br$ | 25 | 0.727 | (41) |
| $HgCl_2$ | 25 | 5.42 | (41) |
| $HgBr_2$ | 25 | 2.84 | (41) |

B = $C_3H_7OH$, *n*-Propyl alcohol.—(*Continued*)

| A = solute | °C | Mol % A | Lit. |
|---|---|---|---|
| $Mg(ClO_4)_2$ | 25 | 16.45 | (164) |
| $Ca(ClO_4)_2$ | 25 | 38.5 | (164) |
| $Ca(NO_3)_2$ | 25 | 17.4 | (29) |
| $Sr(ClO_4)_2$ | 25 | 22.7 | (164) |
| $Sr(NO_3)_2$ | 25 | 0.0057 | (29) |
| $Ba(ClO_4)_2$ | 25 | 11.89 | (164) |
| LiCl | 25 | 18.7 | (151) |
| $LiClO_4$ | 25 | 37.1 | (164) |
| $LiClO_4.3H_2O$ | 25 | 12.04 | (164) |
| LiI (crys. $AB_4$) | 25 | 17.6 | (151) |
| NaCl(c) | 25 | | (151) |
| | 25 | | (41) |
| $NaClO_4$ | 25 | 2.37 | (164) |
| NaBr | 25 | | (20, 41) |
| | 25 | 0.00221 | (20) |
| NaI(c) | 25 | | (41, 151) |
| KCl(c) | 25 | 0.00321 | (151) |
| $KClO_4$ | 25 | 0.00433 | (164) |
| KBr | 25 | 0.0177 | (151) |
| KI | 25 | | (20, 151) |
| | 25 | 0.00112 | (20) |
| RbCl | 25 | 0.0074 | (151) |
| $RbClO_4$ | 25 | 0.0019 | (164) |
| RbI | 25 | 0.076 | (20) |
| | 25 | 0.00048 | (20) |
| $CsClO_4$ | 25 | 0.0015 | (164) |
| B = $C_3H_8O_3$, Glycerol: a = sp. gr. 1.2326, b = sp. gr. 1.2645 | | | |
| $NH_4Cl$ | 25 | 15.44 | (40) |
| | 20 | 17.8ab | (46) |
| $NH_4Br$ | 20 | 23.05a | (46) |
| | 20 | 20.35b | (46) |
| $(CH_3COO)_2Pb$ | 20 | 26.7a | (46) |
| | 20 | 28.8b | (46) |
| $HgCl_2$ | 20 | 15.35a | (46) |
| | 20 | 20.4b | (46) |
| $Hg(CN)_2$ | 15.5 | 8.98 | (22) |
| $CuSO_4.5H_2O$ | 15.5 | 13.6 | (125) |
| $B(OH)_3$ | 25 | 25.9 | (40) |
| $Ca(OH)_2$ | 25 | 0.198 | (40) |
| $[C_3H_5(OH)_2.OPO_3]_2Ca$, Glycerophosphate | 20 | 0.993a | (46) |
| | 20 | 0.956b | (46) |
| NaCl | 25 | 11.40 | (40) |
| | 20 | 14.04a | (46) |
| | 20 | 11.55b | (46) |
| NaBr | 20 | 28.6a | (46) |
| | 20 | 25.7b | (46) |
| $Na_2CO_3$ | 20 | 48–52a | (46) |
| | 20 | 40–47b | (46) |
| $NaHCO_3$ | 20 | 4.25ab | (46) |
| $Na_2C_3H_7PO_6.5\frac{1}{2}H_2O$, Glycerophosphate | 20 | 27.5a | (46) |
| | 20 | 28.2b | (46) |
| $C_6H_5COONa$ | 20 | 16.7a | (46) |
| | 20 | 15.4b | (46) |
| $Na_2B_2O_7$ | 20 | 28.6a | (46) |
| | 20 | 33.6b | (46) |
| KCl | 25 | 7.82 | (40) |
| $KClO_3$ | 20 | 0.982a | (46) |
| | 20 | 0.774b | (46) |
| KBr | 25 | 12.08 | (40) |
| | 20 | 13.75a | (46) |
| | 20 | 11.75 | (46) |

B = $C_3H_8O_3$, Glycerol.—(*Continued*)

| A = solute | °C | Mol % A | Lit. |
|---|---|---|---|
| KI | 15.5 | 18.16 | (60) |
| | 20 | 24.5a | (46) |
| | 20 | 21.9b | (46) |
| $K_2CO_3$ | 20 | 21.3b | (46) |
| | 20 | 20.75b | (46) |
| $KOOCCH_3$ | 20 | 42.0a | (46) |
| | 20 | 38.1b | (46) |
| KCN | 15.5 | 31.15 | (140) |
| B = $C_4H_8O_2$, Ethyl acetate | | | |
| $NH_4ClO_4$ | 25 | 0.024 | (164) |
| $SbCl_3$ | 18 | 2.24 | (119) |
| $BiCl_3$ | 18 | 1.62 | (119) |
| $SnCl_2$ | 18 | 2.04 | (119) |
| $SnCl_2.2H_2O$ | − 2 | 10.55 | (60) |
| | 22 | 12.15 | (60) |
| | 82 | 22.2 | (60) |
| $HgBr_2$ | 18 | 3.09 | (119) |
| | 25 | 3.82 | (39) |
| $HgI_2$ | − 2 | 0.288 | (60) |
| | 18 | 0.294 | (39, 60, 119) |
| | 40 | 0.489 | (60) |
| | 55 | 0.614 | (60) |
| $HgI_2$ (red) | 76 | 0.818 | (60, 147) |
| $Hg(CN)_2$ | 25 | 0.70 | (39) |
| $CuCl_2$ | 18 | 0.26? | (115) |
| | 20 | 2.0 | (32) |
| | 40 | 1.7 | (32) |
| | 72 | 0.86 | (32) |
| $CoCl_2$(c) | 14 | 0.054 | (60) |
| | 79 | 0.17 | (60) |
| $(UO_2)(NO_3)_2.6H_2O$ | 10.5 | 0.93 | (32) |
| $Mg(ClO_4)_2$ | 25 | 21.89 | (164) |
| $Ca(ClO_4)_2$ | 25 | 32.3 | (164) |
| $Sr(ClO_4)_2$ | 25 | 25.2 | (164) |
| $Ba(ClO_4)_2$ | 25 | 22.80 | (164) |
| $LiClO_4$ | 25 | 44.0 | (164) |
| $LiClO_4.3H_2O$ | 25 | 15.83 | (164) |
| NaCl | 17 | 0.36 | (65) |
| | 40 | 0.60 | (65) |
| $NaClO_4$ | 25 | 6.48 | (164) |
| $KClO_4$ | 25 | 0.00095 | (164) |
| $RbClO_4$ | 25 | 0.00076 | (164) |
| $CsClO_4$ | 25 | 0.000 | (164) |
| B = $C_4H_9Cl$, Isobutyl chloride | | | |
| $HgI_2$ (yellow) | 69 | 0.0668 | (147) |
| B = $C_4H_9OH$, *n*-Butyl alcohol | | | |
| $NH_4ClO_4$ | 25 | 0.011 | (164) |
| $Mg(ClO_4)_2$ | 25 | 17.54 | (164) |
| $Ca(ClO_4)_2$ | 25 | 37.6 | (164) |
| $Sr(ClO_4)_2$ | 25 | 22.6 | (164) |
| $Ba(ClO_4)_2$ | 25 | 11.35 | (164) |
| LiCl | 25 | 18.4 | (163) |
| $LiClO_4$ | 25 | 35.3 | (163, 164) |
| $LiClO_4.3H_2O$ | 25 | 11.15 | (164) |
| NaCl | 25 | 0.018 | (163) |
| $NaClO_4$ | 25 | 1.11 | (163, 164) |
| | 116 | 4.73 | (163, 164) |
| NaBr | 25 | 0.00120 | (20) |
| $KClO_4$ | 25 | 0.0045–0.0016* | (163, 164) |

* Wt % A.

B = $C_4H_9OH$, *n*-Butyl alcohol.—*(Continued)*

| A = solute | °C | Mol % A | Lit. |
|---|---|---|---|
| KI | 25 | 0.00037 | (20) |
| $RbClO_4$ | 25 | 0.0008 | (164) |
| RbI | 25 | 0.0002 | (20) |
| $CsClO_4$ | 25 | 0.0019 | (164) |
| B = $C_4H_{10}O$, Isobutyl alcohol | | | |
| $NH_4ClO_4$ | 25 | 0.0800 | (164) |
| $HgI_2$ (yellow) | 106 | 0.395 | (147) |
| $Mg(ClO_4)_2$ | 25 | 13.10 | (164) |
| $Ca(ClO_4)_2$ | 25 | 23.2 | (164) |
| $Ca(NO_3)_2$(c) | 25 | 13.1 | (29) |
| $Sr(ClO_4)_2$ | 25 | 16.8 | (164) |
| $Sr(NO_3)_2$(c) | 25 | 0.0035 | (29) |
| $Ba(ClO_4)_2$ | 25 | 11.00 | (164) |
| $LiClO_4$ | 25 | 28.8 | (164) |
| $LiClO_4.3H_2O$ | 25 | 9.68 | (164) |
| $NaClO_4$ | 25 | 0.474 | (164) |
| NaBr | 25 | 0.186 | (20) |
| $KClO_4$ | 25 | 0.00268 | (164) |
| KI | 25 | 0.056 | (20) |
| $RbClO_4$ | 25 | 0.0016 | (164) |
| RbI | 25 | 0.022 | (20) |
| $CsClO_4$ | 25 | 0.0022 | (164) |
| B = $C_4H_{10}O$, Ethyl ether | | | |
| $NH_4Br$ | 15 | 0.093 | (22) |
| $NH_4ClO_4$ | 25 | 0.000 | (164) |
| $C_{12}H_{22}O_4Pb$ | | gA/l | |
| Caproate | B. P. sat. | 13.64 | (122) |
| $C_{14}H_{26}O_4Pb$ | 20 | 2.40 | (122) |
| Heptylate | B. P. sat. | 14.90 | (122) |
| $C_{16}H_{30}O_4Pb$ | 20 | 0.938 | (122) |
| Caprylate | B. P. sat. | 5.460 | (122) |
| $C_{18}H_{34}O_4Pb$ | 20 | 1.115 | (122) |
| Nonylate | B. P. sat. | 2.404 | (122) |
| $C_{20}H_{38}O_4Pb$ | 20 | 0.290 | (122) |
| Caprate | B. P. sat. | 4.285 | (122) |
| $C_{24}H_{46}O_4Pb$, Laurate* | B. P. sat. | 0.205 | (122) |
| $C_{28}H_{54}O_4Pb$, Myristate* | B. P. sat. | 0.555 | (122) |
| $C_{32}H_{62}O_4Pb$, Palmitate* | B. P. sat. | 0.261 | (122) |
| $C_{36}H_{70}O_4Pb$, Stearate* | B. P. sat. | 0.000 | (122) |
| The above soaps in petroleum ether, *v.* (122) | | | |
| | | Mol % A | |
| $CdBr_2.4H_2O$ | 15 | 0.086 | (31) |
| $CdI_2$ | 0 | 0.0304 | (65) |
| | 20 | 0.0507 | (65) |
| $HgI_2$ (red) | 0 | 0.102 | (60) |
| | 35 | | (60, 147) |
| $CuCl_2$ | Room | 0.0237 | (17) |
| $CuCl_2.2H_2O$ | Room | 0.0265 | (17) |
| $AgNO_3$ | 19 | 0 | (22) |
| $CoCl_2$(c) | Room | 0.0128 | (17) |
| $CoCl_2.6H_2O$ | Room | 0.091 | (17) |
| $(UO_2)(NO_3)_2.6H_2O$ | 12.5 | 0.89 | (125) |
| $Mg(ClO_4)_2$ | 25 | 0.097 | (164) |
| $Ca(ClO_4)_2$ | 25 | 0.137 | (164) |
| Ca soaps of various fats, *v.* (138) | | | |
| $Sr(ClO_4)_2$ | 25 | 0.000 | (164) |
| $Ba(ClO_4)_2$ | 25 | 0.000 | (164) |
| $LiClO_4$ | 25 | 44.2 | (164) |
| $LiClO_4.3H_2O$ | 25 | 0.0907 | (164) |
| $NaClO_4$ | 25 | 0.000 | (164) |
| $KClO_4$ | 25 | 0.000 | (164) |
| $RbClO_4$ | 25 | 0.000 | (164) |
| $CsClO_4$ | 25 | 0.000 | (164) |

*Insoluble at 20°C.

B = $C_4H_4O_2$, Furfural

| A = solute | °C | Mol % A | Lit. |
|---|---|---|---|
| LiI | 25 | | (157) |
| NaI | 25 | 16.9 | (157) |
| KCl | 25 | 0.1095 | (139) |
| KBr | 25 | 0.112 | (157) |
| KI | 25 | 2.915 | (157) |
| RbI | 25 | 1.94 | (157) |
| B = $C_5H_5N$, Pyridine | | | |
| $ZrCl_4$ | 19 | 6.77 | (26) |
| $CuCl_2$ | 18.8 | 13.1 | (147) |
| AgI | 10 | 0.034 | (60) |
| | 121 | 2.81 | (60) |
| $YtCl_3$ | 15 | 2.56 | (84) |
| $PrCl_3$ | 15 | 0.68 | (84) |
| $NdCl_3$ | 15 | 0.568 | (84) |
| $SaCl_3$ | 15 | 1.98 | (84) |
| LiCl | 15 | 12.0 | (60) |
| | 100 | 20.8 | (60) |
| KCl | 10 | 0.000 | (139) |
| KI | 10 | 0.124 | (60) |
| | 119 | 0.0524 | (60) |
| B = $C_5H_{10}O_2$, Propyl acetate | | | |
| $Hg(CN)_2$ | 25 | 1.72 | (39) |
| B = $C_5H_{11}NO_2$, Ethylurethane | | | |
| $NH_4Cl$ | 60 | 0.210 | (146.5) |
| $NH_4I$ | 60 | 5.73 | (146.5) |
| NaCl | 60 | 0.192 | (146.5) |
| NaBr | 60 | 4.11 | (146.5) |
| KCl | 60 | 0.1197 | (146.5) |
| KBr | 60 | 0.277 | (146.5) |
| KI | 60 | 3.23 | (146.5) |
| RbBr | 60 | 0.292 | (146.5) |
| RbI | 60 | 1.67 | (146.5) |
| B = $C_5H_{12}O$, Isoamyl alcohol | | | |
| $HgI_2$ | 13 | 0.127 | (60) |
| | 71 | 0.704 | (60) |
| | 100 | 1.015 | (60) |
| | 133.5 | 1.813 | (60) |
| $Ca(NO_3)_2$ | 25 | 7.61 | (29) |
| $Sr(NO_3)_2$ | 25 | 0.0012 | (29) |
| LiCl | 25 | 15.8 | (151) |
| LiI(c) | 25 | 42.5 | (151) |
| NaCl | 25 | 0.0030 | (151) |
| NaBr | 25 | 0.1 | (20) |
| | 25 | 0.0006 | (20) |
| NaI | 25 | 8.56 | (151) |
| KCl(c) | 25 | 0.0009 | (151) |
| KBr | 25 | 0.00222 | (151) |
| KI | 25 | 0.0494 | (20, 151) |
| | 25 | 0.00031 | (20) |
| KCNS | 13 | 0.164 | (60) |
| | 65 | 1.22 | (60) |
| | 100 | 1.93 | (60) |
| | 133.5 | 2.78 | (60) |
| RbCl | 25 | 0.00182 | (151) |
| RbI | 25 | 0.022 | (20) |
| | 25 | 0.00014 | (20) |
| B = $C_6H_5NO_2$, Nitrobenzene | | | |
| $BaCl_2$ | 20 | 0.0082 | (66) |
| | 50 | 0.016 | (66) |
| | 100 | 0.020 | (66) |

B = $C_6H_6$, Benzene

| A = solute | °C | Mol % A | Lit. |
|---|---|---|---|
| $SnI_4$ | 20.2 | 1.775 | (74) |
| $CdI_2$ | 16 | 0.100 | (65) |
| | 35 | 0.200 | (65) |
| $HgI_2$ | 15 | 0.038 | (60) |
| | 60 | 0.151 | (60) |
| | 65 | 0.168 | (60) |
| | 84 | 0.211 | (60) |
| (Yellow) | 80 | 0.143 | (147) |
| $AgNO_3$ | 35 | 0.101 | (65) |
| | 40.5 | 0.203 | (65) |

Ca soaps of various fats, *v.* (138)

B = $C_6H_{14}$, *n*-Hexane

| | | | |
|---|---|---|---|
| $HgI_2$ (yellow) | 67 | 0.0137 | (147) |

B = $C_6H_{14}O_2$, Acetal

| | | | |
|---|---|---|---|
| $HgI_2$ (yellow) | 105 | 0.518 | (147) |

B = $C_7H_5N$, Benzonitrile

| | | | |
|---|---|---|---|
| $CdCl_2$ | 18 | 0.0355 | (120) |
| $CdBr_2$ | 18 | 0.325 | (120) |
| $CdI_2$ | 18 | 0.457 | (120) |
| $Hg(CN)_2$ | 18 | 0.444 | (120) |
| $AgNO_3$ | 18 | 38.9 | (120) |

B = $C_7H_6O$, Benzaldehyde

| | | | |
|---|---|---|---|
| KI | 25 | 0.210 | (157) |

B = $C_7H_6O_2$, Salicylaldehyde

| | | | |
|---|---|---|---|
| KI | 0 | 0.806 | (157) |
| | 25 | 0.356 | (157) |

B = $C_{11}H_{12}N_2O$, Antipyrine

| | | | |
|---|---|---|---|
| $Zr(NO_3)_4$, $AB_6$ melts 217–218° | | | (55) |
| $Th(NO_3)_4$, $A_2B_5$ melts 168–169° | | | (55) |
| $Yt(NO_3)_3$, $AB_4$ melts 176–177° | | | (55) |
| $La(NO_3)_3$, $AB_3$ melts 161–162° | | | (55) |
| $Ce(NO_3)_3$, $AB_3$ melts 165°... | | | (55) |
| $Sa(NO_3)_3$, $AB_3$ melts 177–178° | | | (55) |
| $Er(NO_3)_3$, $AB_4$ melts 175–176° | | | (55) |

B = $C_7H_8O_2$, Anisaldehyde

| | | | |
|---|---|---|---|
| KI | 0 | 1.114 | (157) |
| | 25 | 0.528 | (157) |

## PART III

## THREE-COMPONENT SYSTEMS

For abbreviations, *v.* p. 4

### Solubility of $CdI_2$ in Mixed Solvents (114)

A = $CH_3OH$, B = $CHCl_3$, C = $C_2H_5OH$, D = $C_6H_6$, E = $C_5H_5N$, Mol % of $CdI_2$ in mixed solvent having molal composition shown

| *t*, °C | A + B | A + 2B | B + C | 2B + C | C + D | 2C + D | C + 2D |
|---|---|---|---|---|---|---|---|
| 0 | 5.63 | 2.96 | 3.53 | 2.06 | 5.65 | 10.45 | 5.57 |
| 16.8 | 5.60 | 2.78 | 3.64 | 1.94 | 5.62* | 11.32† | 5.11 |
| 36.8 | 5.10 | 2.47 | 3.43 | 1.80 | 5.6 | | 4.73 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *t* | 57.9° | 60.3° | 66.7° | 70.6° | 71.5° | 71.5° |
| D + E | 0.385 | 0.476 | 1.276 | 2.45 | 3.60 | 4.47 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *t* | 71.6° | 72.25° | 72.5° | 72.5° | 78.9° | 90.4° |
| D + E | 5.36 | 7.06 | 7.92 | 9.44 | 12.80 | 13.78 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *t* | 50.1° | 53.9° | 58.1° | 62.45° | 64.2° | 64.5° |
| B + E | 0.348 | 0.470 | 1.13 | 1.67 | 2.61 | 3.67 |

| | | | | | |
|---|---|---|---|---|---|
| *t* | 62.5° | 61.15° | 67.3° | 85.5° | 89.7° |
| B + E | 6.44 | 8.16 | 10.23 | 12.95 | 13.74 |

*$t$ = 15.7°. †$t$ = 15°.

A = $HClO_4$
B = $KClO_4$
C = $CH_3OH$ (13)

| Wt. % A | g B per 1 C 0° | 20° |
|---|---|---|
| 0.0 | 0.495 | 0.747 |
| 0.4 | | 0.216 |
| 0.8 | 0.093 | 0.177 |
| 2.4 | | 0.1225 |

A = $HClO_4$
B = $KClO_4$
C = $C_2H_5OH$ (12)

| | | |
|---|---|---|
| 0.0 | 0.047 | 0.080 |
| 0.05 | 0.019 | 0.046 |
| 0.10 | 0.020 | 0.040 |
| 0.15 | 0.018 | 0.035 |
| 0.20 | 0.018 | 0.031 |
| 0.30 | 0.019 | 0.040 |

A = $H_2SO_4$
B = $Na_2SO_4$
C = $C_2H_5OH$ (30.5)

A = $HgCl_2$
B = $C_2H_5OH$
C = $(C_2H_5)_2O$ (1)
*t* = 18°C?

| Wt. % A | Wt. % B |
|---|---|
| 32.43 | 67.57 |
| 35.50 | 58.59 |
| 37.39 | 51.02 |
| 37.96 | 44.79 |
| 38.24 | 38.69 |
| 37.75 | 32.84 |
| 36.29 | 27.16 |
| 34.08 | 22.48 |
| 28.55 | 15.20 |
| 20.67 | 8.97 |
| 5.49 | 0.00 |

A = $HgCl_2$
B = NaCl
C = $C_2H_5OH$ (34)
*t* = 25°C

| A + B |
|---|
| 46.86 \| 3.02 |

A = $HgCl_2$
B = KCl
C = $C_2H_5OH$ (34)
*t* = 25°C

| Wt. % A | Wt. % B |
|---|---|
| A + $A_6B_5C_2$ | |
| 33.745 | 0.245 |
| $A_6B_5C_2$ | |
| 24.84 | 0.22 |
| 6.21 | 0.28 |
| $A_6B_5C_2$ + B | |
| 1.42 | 0.27 |

A = $HgCl_2$
B = KCl
C = $(CH_3)_2CO$ (34)
*t* = 25°C

| | |
|---|---|
| A + $A_5BC$ | |
| 61.87 | 1.27 |
| $A_5BC$ | |
| 60.68 | 1.39 |
| 56.59 | 2.33 |
| 55.85 | 2.58 |
| $A_5BC$ + $A_6B_5C_2$ | |
| 54.62 | 2.78 |
| $A_6B_5C_2$ | |
| 48.13 | 2.93 |
| 38.94 | 2.82 |
| 18.04 | 2.51 |
| 13.26 | 2.34 |
| $A_6B_5C_2$ + B | |
| 10.99 | 2.92 |

A = $HgCl_2$
B = CsCl
C = $(CH_3)_2CO$ (35)
*t* = 25°C

| | |
|---|---|
| A | |
| 57.74 | 0.00 |
| A + $A_5B$ | |
| 57.77 | 0.14 |
| $A_5B$ | |
| 57.74 | 0.20 |
| 52.54 | 0.22 |
| 49.83 | 0.32 |
| $A_5B$ + $A_2B$ | |
| 44.39 | 0.47 |
| $A_2B$ | |
| 39.65 | 0.48 |
| 28.48 | 0.48 |
| $A_2B$ + AB | |
| 27.14 | 0.57 |
| AB | |
| 21.50 | 0.46 |

*t* = 25°C

| Wt. % A | Wt. % B |
|---|---|
| A + $A_6B_5C_2$ | |
| 13.08 | 0.45 |
| 0.16 | 0.19 |
| 0.17 | 0.25 |
| 0.02 | 0.11 |
| B | |
| 0.00 | 0.032 |

A = $HgI_2$
B = KI
C = $(CH_3)_2CO$ (130.5)

A = $CuCl_2$
B = KCl
C = $C_2H_5OH$ (36)
*t* = 25°C

| | |
|---|---|
| AB + B | |
| 1.39 | 0.28 |
| AB | |
| 2.15 | |
| 5.25 | |
| 30.16 | |
| AB + AC | |
| 34.30 | 0.21 |
| AC | |
| 33.97 | 0.00 |

A = $CuCl_2$
B = KCl
C = $(CH_3)_2CO$ (36)
*t* = 25°C

| | |
|---|---|
| AB + B | |
| 0.34 | 0.38 |
| AB | |
| 0.48 | |
| 1.50 | |
| 2.06 | |
| AB + AC | |
| 2.40 | 0.27 |

A = $AgNO_2$
B = $C_2H_5OH$
C = $(C_2H_5)_2O$ (31)
*t* = 15°C
1B + 1C by vol. dissolves 1.575 Wt. % A
2B + 1C by vol. dissolves 2.25 Wt. % A

## LITERATURE

(For a key to the periodicals see end of volume)

(1) Abe, *41*, **33:** 1087; 12. (2) Aten, *7*, **54:** 121; 06. (3) Atkins and Werner, *4*, **101:** 1167; 12. (4) Baume, *42*, **9:** 245; 11. (5) Baume, *42*, **12:** 216; 14. (6) Baume and Borowski, *42*, **12:** 276; 14. (7) Baume and Georgitses, *42*, **12:** 250; 14. (8) Baume and Germann, *42*, **12:** 242; 14. (9) Baume and Pamfil, *34*, **155:** 426; 12.
(10) Baume and Pamfil, *42*, **12:** 256; 14. (11) Baume and Perrot, *42*, **12:** 225; 14. (12) Baxter and Kobayashi, *1*, **39:** 249; 17. (13) Baxter and Rupert, *1*, **42:** 2046; 20. (14) Bellucci and Grassi, *36*, **44 I:** 559; 14. (15) Bertheaume, *34*, **150:** 1063; 10. (17) Bödtker, *7*, **22:** 505; 97. (18) Bokhorst, *Diss.*, Amsterdam, 1915. (19) Bond and Beach, *1*, **43:** 348; 26. (19.5) Bonnell and Jones, *4*, **129:** 318; 26.
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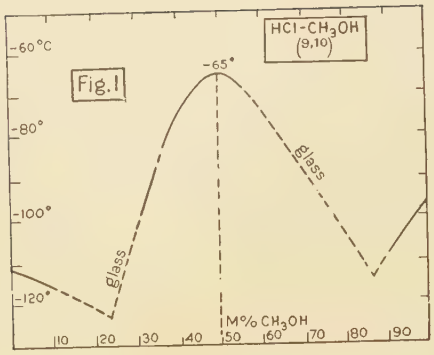
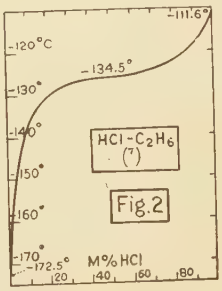
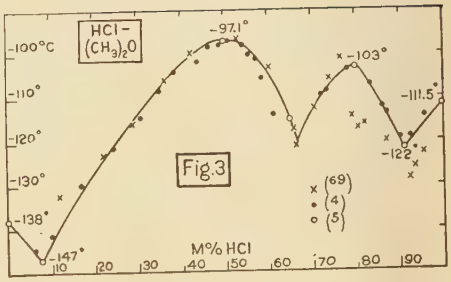
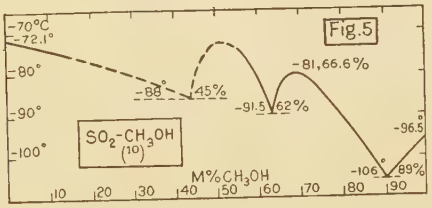
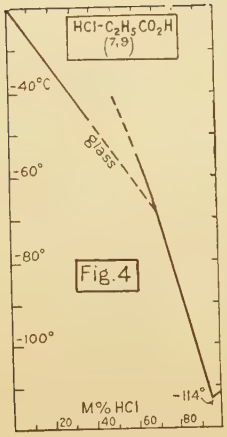
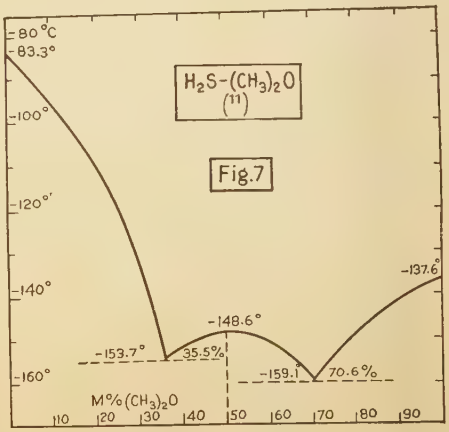

HCl-CH3OH
(9,10)
Fig.1
-60°C
-80°
-100°
-120°
-65°
glass
glass
M% CH3OH
110 120 130 140 150 160 170 180 190

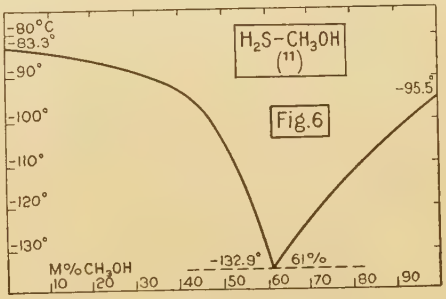

-120°C
-130°
-140°
-150°
-160°
-170°
-111.6°
-134.5°
HCl-C2H6
(7)
Fig.2
-172.5°
M% HCl
120 140 160 180

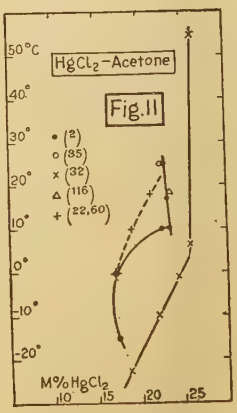

HCl-
(CH3)2O
-100°C
-110°
-120°
-130°
-138°
-147°
-97.1°
-103°
-111.5°
-122°
Fig.3
(69)
(4)
(5)
M% HCl
110 120 130 140 150 160 170 180 190

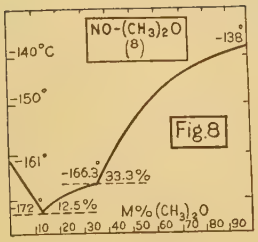

-70°C
-72.1°
-80°
-90°
-100°
Fig.5
-88°
45%
-91.5
62%
-81,66.6%
-96.5
-106°
89%
SO2-CH3OH
(10)
M% CH3OH
110 120 130 140 150 160 170 180 190

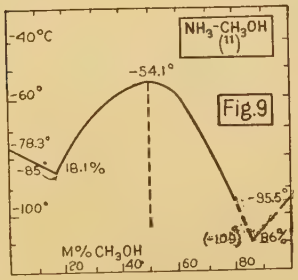

HCl-C2H5CO2H
(7,9)
-40°C
-60°
-80°
-100°
glass
Fig.4
-114°
M% HCl
120 140 160 180

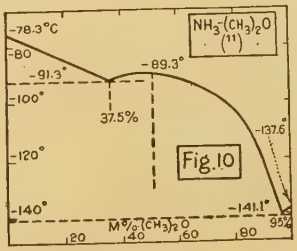

-80°C
-83.3°
-100°
-120°
-140°
-160°
H2S-(CH3)2O
(11)
Fig.7
-137.6°
-148.6°
-153.7°
35.5%
-159.1°
70.6%
M% (CH3)2O
110 120 130 140 150 160 170 180 190

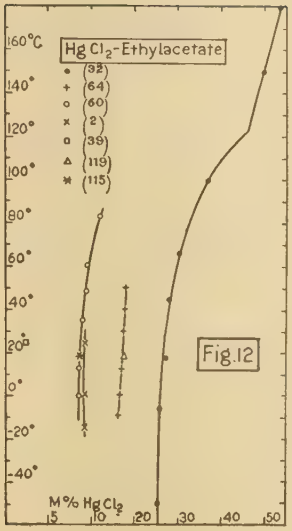

-80°C
-83.3°
-90°
-100°
-110°
-120°
-130°
H2S-CH3OH
(11)
Fig.6
-95.5°
-132.9°
61%
M% CH3OH
110 120 130 140 150 160 170 180 190

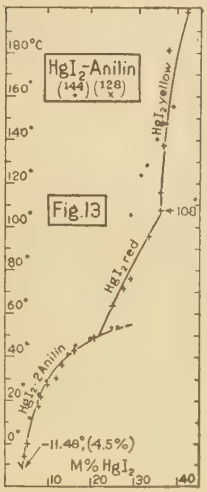

50°C
40°
30°
20°
10°
0°
-10°
-20°
HgCl2-Acetone
Fig.11
(2)
(85)
(32)
(116)
(22,60)
M% HgCl2
110 115 120 125


NO-(CH3)2O
(8)
-140°C
-150°
-161°
-172°
-138°
-166.3°
33.3%
12.5%
Fig.8
M% (CH3)2O
110 120 130 140 150 160 170 180 190


-40°C
-60°
-78.3°
-85°
-100°
NH3-CH3OH
(11)
-54.1°
Fig.9
18.1%
-95.5°
(-109°)
86%
M% CH3OH
120 140 160 180


-78.3°C
-80
-91.3°
-100°
-120°
-140°
NH3-(CH3)2O
(11)
-89.3°
37.5%
-137.6°
Fig.10
-141.1°
95%
M% (CH3)2O
120 140 160 180


$HgCl_2$-Ethylacetate
(32)
(64)
(60)
(2)
(39)
(119)
(115)
Fig.12
M% $HgCl_2$


$HgI_2$-Anilin
(144) (128)
Fig.13
$HgI_2$ yellow
$HgI_2$ red
$HgI_2$·2Anilin
-11.46°,(4.5%)
M% $HgI_2$

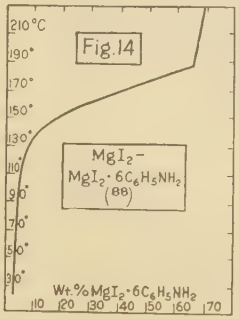
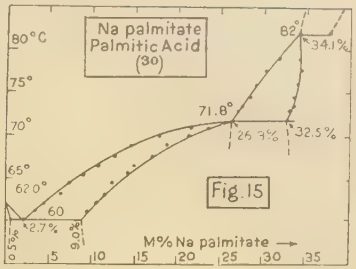
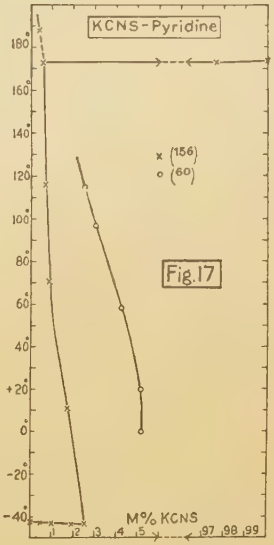
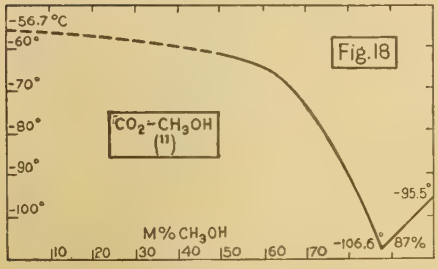
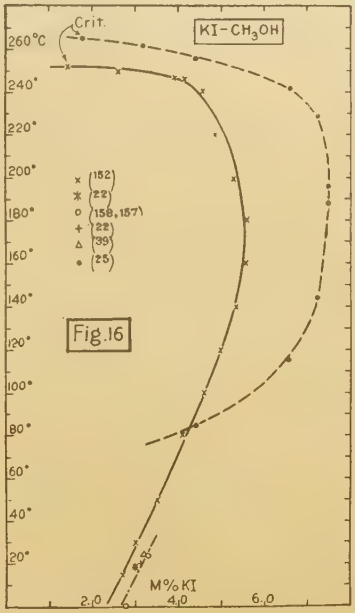


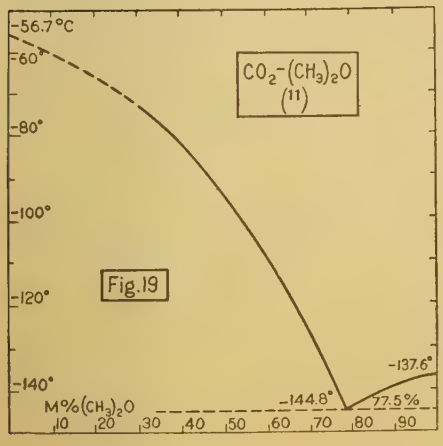
Fig.14
$MgI_2$-
$MgI_2 \cdot 6C_6H_5NH_2$
(88)
Wt.% $MgI_2 \cdot 6C_6H_5NH_2$

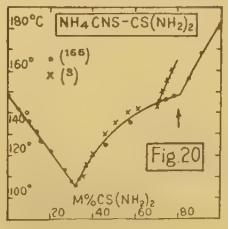

Na palmitate
Palmitic Acid
(30)
82°
34.1%
71.8°
26.3%
32.5%
62.0°
60
2.7%
9.0%
0.5%
Fig.15
M% Na palmitate


KCNS-Pyridine
(156)
(60)
Fig.17
M% KCNS


-56.7 °C
Fig.18
$CO_2$-$CH_3OH$
(11)
-95.5°
M% $CH_3OH$
-106.6°
87%


Crit.
KI-$CH_3OH$
(152)
(22)
(158,157)
(22)
(39)
(25)
Fig.16
M% KI


-56.7 °C
$CO_2$-$(CH_3)_2O$
(11)
Fig.19
-137.6°
-144.8°
77.5%
M% $(CH_3)_2O$


$NH_4CNS$-$CS(NH_2)_2$
(166)
(3)
Fig.20
M% $CS(NH_2)_2$

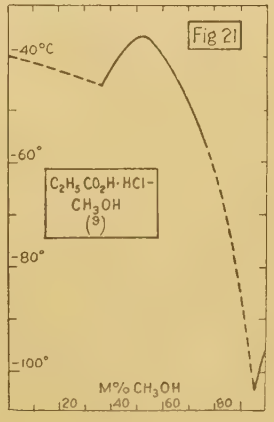


Fig 21
$C_2H_5CO_2H \cdot HCl$-
$CH_3OH$
(3)
M% $CH_3OH$

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(40) Herz and Knoch, *93*, **41**: 315; 04. **45**: 262; 05. **46**: 193; 05. (41) Herz and Kuhn, *93*, **60**: 152; 08. (42) Hill, *1*, **43**: 254; 21. (43) Hill, *1*, **44**: 1163; 22. (44) Hill and Macy, *1*, **46**: 1132; 24. (44.5) Hill and Miller, *1*, **47**: 2703; 25. (45) Hofmann, Kirmreuther and Thal, *25*, **43**: 183; 10. (46) Holm, *184*, **94**: 138; 22. *Thesis*, Amsterdam, 1921. (47) Isbekow, *92*, **143**: 80; 25. (48) James, *4*, **103**: 1368; 12. (49) Jonescu, *Diss.*, Geneva, 1913.

(50) Kelech, *Thesis*, Zürich, 1912. (51) Kendall and Adler, *1*, **43**: 1470; 21. (52) Kendall and Carpenter, *1*, **36**: 2498; 14. (53) Kendall, Crittenden and Miller, *1*, **45**: 963; 23. (54) King and Partington, *4*, **129**: 20; 26. (55) Kolb, *93*, **83**: 143; 13. (56) Kraus and Greer, *1*, **45**: 3078; 23. (57) Krug and McElroy, *320*, **6**: 184; 92. (58) Kurnakov, *53*, **48**: 1672; 16. (59) Kurnakov, Perelmuter and Kanov, *169*, **24**: 399; 15. *10*, **4**: 205; 21.

(60) Laszczynskii, *25*, **27**: 2285; 94. (61) Laurie, *68*, **31**: 375; 12. (62) Lemoine, *34*, **125**: 603; 97. (63) Leopold, *7*, **71**: 59; 10. (64) Linebarger, *11*, **16**: 214; 94. (65) Linebarger, *12*, **49**: 48; 95. (66) Lloyd, *50*, **22**: 300; 18. (67) Maass, Boomer and Morrison, *1*, **45**: 1433; 23. (68) Maass and Hatcher, *1*, **44**: 2472; 22. (69) Maass and McIntosh, *1*, **34**: 1273; 12.

(70) Maass and McIntosh, *1*, **35**: 535; 13. (71) Maass and Russell, *1*, **40**: 1561; 18. (72) Maass and Russell, *1*, **43**: 1227; 21. (73) McBride, *50*, **14**: 189; 10. (74) McDermott, *1*, **33**: 1963; 11. (75) McIntosh, *1*, **33**: 71; 11. (76) McMaster and Pratte, *1*, **45**: 2999; 23. (77) Macy, *1*, **47**: 1032; 25. (78) Macy and Thomas, *1*, **48**: 1547; 26. (79) Mameli and Cocconi, *36*, **52 II**: 113; 22.

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## Part IV. Cryoscopic Data

In the following tables are given, arranged by solvents, the following information, in the order stated:

(*a*) The solvent.

(*b*) Its freezing point.

(*c*) A "best" value (where determined) for the molal lowering, $k_F$ ($= \Delta t/N$) for a normal solute in dilute solution in the solvent, as deduced from the freezing-point data ($N$ = moles of solute per 1000 g solvent).

(*d*) A list of the solutes which have been studied in the solvent, each solute, or the list of solutes, being followed (in parentheses) by the approximate upper limit of the concentrations (*c*) studied expressed in the units stated at the end of the list.

(*e*) The literature references.

From the value of $k_F$ for a normal solute in dilute solution, the latent heat of fusion, $l$ in g-cal per g of solvent may be calculated from the relation $l = \frac{1.99 T_F^2}{1000 k_F}$, where $T_F$ is the absolute freezing point of the pure solvent. Most of the investigations reported below were for the purpose of determining molecular weights in solution, and for the authors' conclusions with respect to this subject, reference should be had to the original literature.

### I. Inorganic Solvents

Standard arrangement by solvents

**HBr:** −91°C; $k_F$ = 103.1—acetaldehyde, acetic acid, acetone, carbon tetrachloride, chloroform, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, paraldehyde, toluene (*c* up to *ca.* 2 to 4 g/100 g) (15).

**$I_2$:** $k_F$ = 213—($SnI_4$, $SbI_3$, $AsI_3$ in $HgI_2$); azobenzene, benzoic acid, benzoic anhydride, *p*-dibromobenzene, *p*-dinitrobenzene, diphenyl, β-iodopropionic acid, methyl iodide, naphthalene, phenanthraquinone, and the following substituted ammonium iodides: phenyl, tetramethyl, trimethyltolyl, trimethylphenyl (*c* up to *ca.* 1 to 7 Wt. % solute) (14).

(1) **$H_2SO_4$ (pure):** $k_F$ = 68.1. (2) **$H_2SO_4$** with M. P. depressed 0.2°C by $H_2O$: In each solvent: acetic, benzoic, butyric, formic, fumaric, isophthalic, maleic, malonic, oxalic, *o*-phthalic, propionic, salicylic, succinic, mono-, di-, and trichloroacetic, *p*-toluic acids. In solvent (2): *o*-, *m*-, *p*-chlorobenzoic, chlorosuccinic, glutaric, methylsuccinic, *o*-nitrobenzoic, sebacic, suberic, and terephthalic acids; acetic, phthalic and succinic anhydrides; acetaldehyde, acetone, benzaldehyde, benzophenone, coumarin, cinnamic aldehyde, ethyl phenyl ketone, fluorenone, menthone, phthalide, valerolactone (*c* up to *ca.* 1 to 3 g/100 g) (10). (3) **$H_2SO_4$** with M. P. depressed 0.1°C by $H_2O$: $k_F$ = 69—trichloroacetic acid, trinitrobenzene, phthalic anhydride, picric acid; $k_F$ = 91–73—dimethyl sulfate, oxalic acid, trinitrotoluene (11).

**$NH_3$:** $NaNO_3$, KI (24); acetanilide (0.0438–0.23289/17.1 g $NH_3$), mannitol (0.1206–0.2785g/17.1 g $NH_3$) (16).

**$2H_3PO_4.H_2O$:** 29°C; $k_F$ = 52.6—acetic, butyric, formic, propionic and valeric acids; $k_F$ = 68—acetone (4).

**$POCl_3$:** 1.25°C; $k_F$ = 77.5—benzene, carbon tetrachloride, naphthalene, nitrobenzene (22); 0.4 to 0.9°C; $k_F$ = 72.1—acetic anhydride, acetone, cyclohexanone, dipropyl ether, hexane; $k_F$ = 78.2—benzene, indene, naphthalene, nitrobenzene, nitronaphthalene, toluene (12).

**$SbCl_5$:** $k_F$ = 18.5—carbon tetrachloride, chloroform, hexachloroethane (8).

**$TiBr_4$:** 38.5°C; $k_F$ = 226—benzene, bromoform, ethyl bromide, tetrabromoethane, tetrabromomethane (3).

**$HgBr_2$:** 236°C; $k_F$ = 290–640—sulfur at concentration of 0.1254–7.870% (13); 236°C; $k_F$ = 396—anthraquinone, phenanthraquinone (13).

$HgI_2$: 255°C; $k_F$ = 540–550—anthraquinone, phenanthraquinone (1).

$Na_2SO_4.10H_2O$: $k_F$ = 32.15 (7).

$Na_2S_2O_3.5H_2O$: 48.5°C; $k_F$ = 42.6—urea (7).

## II. Organic Solvents

### (The C-Arrangement)

$CHBr_3$: diethylammonium chloride (3.5), diethylammonium iodide (3.1), dimethylpyrone (1.2), dipropylammonium chloride (3.2), isobutylammonium chloride (1.5), methylphenylammonium chloride (4.5), phenyldiethylammonium chloride (3.9), phenyldiethylammonium iodide (3.1), tetraisoamylammonium iodide (4.0), tribenzylammonium chloride (1.7), triethylammonium bromide (3.2), triethylammonium chloride (3.6), triethylammonium iodide (0.3) (*c* in g/100 g) (19); $S_2Cl_2$(2.8) g/100 g (2).

$CH_2O_2$, Formic acid: HCl (2.2), $NH_4Cl$ (2.9), $NH_4Br$ (3.9), LiCl (0.8), NaCl (4.6), NaBr (5.0), KCl (3.5), KBr (6.5) (*c* in g/100 g) (25); $H_2SO_4$ (3.2) (9); 8.4°C—diethylammonium chloride (58.0), tetraethylammonium iodide (37.4), tetrapropylammonium iodide (29.9), triethylammonium chloride (36.7), triethylammonium iodide (7.4) (*c* in mol/100 l) (21). *See also infra.*

$C_2H_3ClO_2$, Chloroacetic acid: $H_2SO_4$ (2.69), $HNO_3$ (5.40) (*c* in g/100 g) (9).

$C_2H_4Br_2$: $HNO_3$(2.23) g/100 g (9).

$C_2H_4O_2$, Acetic acid: 16.5°C—ammonium thiocyanate, ethylammonium chloride, tetraamylammonium iodide, tetraethylammonium bromide, tetramethylammonium thiocyanate, tetrapropylammonium iodide, triphenylamylammonium iodide (*c* up to *ca.* 2 to 3 mol/100 cc) (23); diethylammonium chloride (121.0), isobutylammonium chloride (64.2), phenylethylammonium chloride (41.2), tetraethylammonium bromide (42.2), tetraethylammonium chloride (111.3), tetrapropylammonium nitrate (23.7), tetrapropylammonium iodide (31.6), triethylammonium bromide (32.8), triethylammonium chloride (51.2), triethylammonium iodide (13.2) (*c* in mol/100 l) (21); 16.5°C—LiCl (2.5), NaBr (1.4) (*c* in mol/100 cc) (25); $H_2SO_4$ (1.6), $HNO_3$ (3.8) (*c* in g/100 g) (9).

$C_2H_4O_2$, Acetic acid (anhydrous): LiBr, LiI, $LiNO_3$, NaBr, $NaC_2H_3O_2$ (24).

$C_3H_7NO_2$, Urethane: diethylammonium chloride (86.2), isobutylammonium chloride (96.9), quinoline ethiodide (15.2), tetraethylammonium bromide (55.6), tetrapropylammonium iodide (24.2), tetrapropylammonium nitrate (49.3), triethylammonium chloride (59.9) (*c* in mol/100 l) (21).

$C_4H_8O_2$, Ethyl acetate: dimethyl sulfate (3.0) g/100 g (9).

$C_5H_{11}NO_2$, Ethylurethane: $NH_4I$ (0.22), Li salicylate (0.24), KI (0.05), RbI (0.02) (*c* in mol /100 cc) (18).

$C_6H_5NO_2$, Nitrobenzene: $H_2SO_4$ (11.5), $HNO_3$ (6.7) (*c* in g/100 g) (9); 5.66°C—quinoline ethiodide (2.8), tetrapropylammonium iodide (4.4), tetrapropylammonium nitrate (6.2) (*c* in mol/100 l) (21).

$C_6H_6$, Benzene: dimethyl sulfate (4.2) g/100 g (9).

$C_6H_6O$, Phenol: diethylammonium chloride (43.6), isobutylammonium chloride (53.3), tetraethylammonium iodide (30.5), tetrapropylammonium iodide (29.1), tetrapropylammonium nitrate (28.3), triethylammonium bromide (35.4), triethylammonium chloride (42.8), triethylammonium iodide (29.0) (concentration in mol/100 l) (21); aniline hydrochloride (11.5), dimethylammonium chloride (9.3), tetramethylammonium iodide (11.9) (*c* in g/100 cc) (5); Na acetate (3.9), K oximidoketohydrindene (1.35), Rb oximidochloroketohydrindene (2.8) (*c* in g/100 cc) (5).

$C_6H_{12}O$, Cyclohexanol: $LiClO_4$(0. 000849–0.031701 mol/l), LiBr (0.00352–0.02011 mol/l) (17).

$C_7H_9N$, *p*-Toluidine: diethylammonium chloride (75.6), isobutylammonium chloride (87.7), quinoline ethiodide (29.0), phenylethylammonium chloride (47.1), tetraethylammonium bromide (37.6), tetraethylammonium chloride (59.8), tetraethylammonium iodide (28.7), tetrapropylammonium nitrate (39.6), tetrapropylammonium iodide (36.8), triethylammonium bromide (54.1), triethylammonium chloride (76.7) (*c* in mol/100 l) (21).

$C_{10}H_8$, Naphthalene: tetraamylammonium iodide (1.05) mol/100 l (21).

$C_{12}H_{11}N$, Diphenylamine: diethylammonium chloride (30.1), tetraethylammonium iodide (45.6), tetrapropylammonium iodide (24.4), tetrapropylammonium nitrate (25.8), triethylammonium bromide (35.1), triethylammonium chloride (56.7), triethylammonium iodide (33.2) (*c* in mol/100 l) (21); tetraethylammonium iodide (0.86) mol/100 cc (23).

### Solutions with Two or More Solutes

$CHBr_3$: Chlorobenzene + triethylammonium bromide, bromine + triethylammonium chloride, diethylammonium nitrate + iodine, dipropylammonium chloride + triethylammonium chloride, dipropylammonium chloride + tetraisoamylammonium iodide, dipropylammonium chloride + triethylammonium chloride, isobutylammonium chloride + triethylammonium bromide, isobutylammonium chloride + triethylammonium chloride, ethyl iodide + triethylammonium bromide, ethyl iodide + triethylammonium chloride, iodine + phenol, iodine + tetraisoamylammonium chloride, iodine + triethylammonium chloride, iodine + triethylammonium bromide, iodobenzene + triethylammonium bromide (20); $S_2Cl_2$ + $S_8$ (2); diethylammonium chloride + tetrapropylammonium iodide, phenyldiethylammonium chloride + phenyldiethylammonium iodide (20).

$C_6H_6$: iodine + benzoyl iodide, iodine + chlorobenzene, iodine + ethyl iodide, iodine + propyl chloride (20); ethyl alcohol + $CdI_2$, ethyl alcohol + $HgCl_2$, methyl alcohol + $CdI_2$, methyl alcohol + $HgCl_2$, propyl alcohol + $CdI_2$ (1).

A = solute = salts of formic acid. B = solvent = formic acid (6).

| Solute | Observed $\Delta t$ for 5 Mol % B,* °C | Compounds |
|---|---|---|
| $HCOONH_4$ | 5.9 | $AB_3$; AB |
| HCOOK | 6.6 | $AB_3$; $AB_2$; AB |
| HCOONa | 5.9 | $AB_2$; AB |
| HCOOLi | 4.9 | |
| $(HCOO)_2Ba$ | 8.5 | AB |
| | 3.3 | |

*Calculated.

## LITERATURE

(For a key to the periodicals see end of volume)

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# SOLUBILITY OF SALTS AND OF STRONG ACIDS AND BASES IN WATER*

J. N. Brönsted

**Abbreviations and Symbols**; *v. also* p. 4

S = Anhydrous substance.
M = Gram-formula-weight (corresponding to formula given in the heading) per 1000 g $H_2O$.
$x$ = Mole fraction = $\frac{M}{M + 55.51}$.

**Abréviations et Symboles**; *v. aussi*, p. 4

S = Substance anhydre.
M = Poids moléculaire de la formule en grammes pour 1000 g $H_2O$.
$x$ = Fraction moléculaire = $\frac{M}{M + 55,51}$.

**Abkürzungen und Symbole**; *siehe auch* S. 4

S = Wasserlos Substanz.
M = Grammformelgewicht auf 1000 g $H_2O$.
$x$ = Molenbruch = $\frac{M}{M + 55,51}$.

**Abbreviazioni e Simboli**; *v. anche* p. 4

S = Sostanza anidra.
M = Peso della formula espresso in grammi in 1000 g di $H_2O$.
$x$ = Frazione di gr. molecola = $\frac{M}{M + 55,51}$.

## B-TABLE, STANDARD ARRANGEMENT (*v.* Vol. III, p. viii)

**HCl** (14, 15, 394, 438)

| $t$, °C | M ± 3% |
|---|---|
| S · 3Aq | |
| −70 | 10.34 |
| −60 | 11.02 |
| −50 | 12.00 |
| −40 | 13.38 |
| −30 | 15.64 |
| **−24.9** | 18.50 |
| S · 3Aq + S · 2Aq | |
| −27.4E | 21.22 |
| S · 2Aq | |
| −25 | 21.94 |
| −20 | 24.16 |
| **−17.7** | 27.75 |
| −20 | 33.64 |
| S · 2Aq + S · Aq | |
| −23E | 37.16 |
| S · Aq | |
| −22 | 38.1 |
| −20 | 40.5 |
| −18 | 43.9 |
| −16 | 49.3 |
| **−15.3** | 55.5 |

**$HClO_4$** (531) (*See* Fig. 1)

| $t$, °C | $x$ |
|---|---|
| S · Aq | |
| −40 | 0.940 |
| −20 | 0.899 |
| 0 | 0.843 |
| +20 | 0.760 |
| 40 | 0.640 |

**$HClO_4$.**—(*Continued*)

| $t$, °C | $x$ |
|---|---|
| S · Aq | |
| **50** | 0.500 |
| 40 | 0.431 |
| +20 | 0.398 |
| 0 | 0.379 |
| −20 | 0.368 |
| S · 2Aq | |
| −22 | 0.361 |
| −20 | 0.353 |
| **−17.8** | 0.333 |
| −20 | 0.313 |
| −25 | 0.297 |
| −30 | 0.287 |
| −35m | 0.280 |
| −40m | 0.273 |
| −45m | 0.268 |
| S · 2.5Aq | |
| **−29.8** | 0.286 |
| −30 | 0.275 |
| −32 | 0.261 |
| −36 | 0.252 |
| −40m | 0.246 |
| −44m | 0.242 |
| S · 3Aq(β) | |
| −47m | 0.267 |
| −46m | 0.265 |
| −45m | 0.262 |
| −44m | 0.258 |
| **−43.2m** | 0.250 |
| −44m | 0.240 |
| −45m | 0.234 |

**$HClO_4$.**—(*Continued*)

| $t$, °C | $x$ |
|---|---|
| S · 3Aq(β) | |
| −46m | 0.230 |
| −47m | 0.227 |
| −48m | 0.224 |
| S · 3Aq(α) | |
| −41m | 0.223 |
| −40m | 0.226 |
| −39m | 0.230 |
| −38m | 0.236 |
| **−37** | 0.250 |
| −38m | 0.265 |
| −39m | 0.272 |
| −40m | 0.277 |
| −41m | 0.281 |
| S · 3.5Aq | |
| −45m | 0.239 |
| −44m | 0.238 |
| −43m | 0.235 |
| −42m | 0.230 |
| **−41.4m** | 0.222 |
| −42m | 0.212 |
| −44m | 0.202 |
| −46m | 0.198 |
| −48m | 0.194 |
| −50m | 0.191 |
| −52m | 0.189 |

| $t$, °C | Crys. | Liq. |
|---|---|---|
| Mix₁† | | |
| −44m | | 0.246 |
| −42m | | 0.243 |

**$HClO_4$.**—(*Continued*)

| $t$, °C | $x$ Crys. | $x$ Liq. |
|---|---|---|
| Mix₁† | | |
| −40m | | 0.241 |
| −38m | 0.229 | 0.238 |
| −36 | 0.224 | 0.233 |
| **−34** | 0.218 | 0.218 |
| −36 | 0.203 | 0.194 |
| −38 | 0.199 | 0.188 |
| −40 | 0.196 | 0.185 |
| −42 | 0.194 | 0.182 |
| −44 | 0.191 | 0.180 |
| −46 | | 0.178 |
| Mix₂† | | |
| −52m | 0.174 | 0.187 |
| −50m | 0.172 | 0.183 |
| −48m | 0.169 | 0.179 |
| −46 | 0.166 | 0.174 |
| −44 | 0.163 | 0.170 |
| −42 | 0.160 | 0.164 |
| **−41** | 0.156 | 0.156 |
| −42 | 0.151 | 0.147 |
| −44 | 0.146 | 0.138 |
| −46 | 0.142 | 0.133 |
| −48 | 0.139 | 0.128 |
| −50 | 0.136 | 0.124 |
| −52 | 0.134 | 0.120 |
| −54 | 0.131 | 0.117 |
| −56 | 0.129 | 0.144 |

| $t$, °C | $x$ |
|---|---|
| Mix₁ + Mix₂ | |
| −47.2E | 0.177 |

* Except (*a*) solubilities of slightly soluble electrolytes, for which consult the final index under "Electrical conductivity;" (*b*) systems composed of two liquid phases, for which *v.* Vol. III, p. 386; and (*c*) solubility of complex metal-ammonia salts in water, for which the following original literature should be consulted. In most instances, the data given are for only one or two temperatures (66, 67, 68, 69, 83, 85, 116, 141, 142, 257, 284, 289, 349, 404, 520, 521).

* Excepté: (*a*) Solubilités des électrolytes peu solubles, pour lesquelles on consultera l'index final sous "Conductibilité électrique," (*b*) systèmes composés de deux phases liquides, pour lesquels *v.* Vol. III, p. 386 et (*c*) solubilité dans l'eau des sels complexes des métaux avec l'ammoniaque, pour laquelle on consultera les sources bibliographiques originales suivantes. Dans la plupart des cas l'information n'est donnée que pour une ou deux températures seulement (66, 67, 68, 69, 83, 85, 116, 141, 142, 257, 284, 289, 349, 404, 520, 521).

* Ausgenommen: (*a*) Wenig lösliche Elektrolyte, für welche im Schluss-Index unter "Elektrische Leitfähigkeit" nachzusehen ist; (*b*) Systeme mit zwei flüssigen Phasen, *siehe* Bd. III, S. 386; (*c*) Löslichkeit komplexer Metallammoniaksalze in Wasser, für welche die folgende original Literatur heranzuziehen ist. In den meisten Fällen beziehen sich die Angaben nur auf ein oder zwei Temperaturen (66, 67, 68, 69, 83, 85, 116, 141, 142, 257, 284, 289, 349, 404, 520, 521).

* Sono eccettuati: (*a*) Gli elettroliti poco solubili, per i quali si consulta l'indice finale al capitolo "Conducibilità elettrica;" (*b*) i sistemi con due fasi liquide, per i quali *vedi* Vol. III, p: 386; (*c*) le solubilità dei complessi metallammonici nell' acqua, per i quali si consulti la letteratura originale indicata qui di seguito. Nella maggiore parte dei casi i dati si riferiscono solo a una o due temperature (66, 67, 68, 69, 83, 85, 116, 141, 142, 257, 284, 289, 349, 404, 520, 521),

**$HClO_4$.**—*(Continued)*

| *t*, °C | *x* |
|---|---|
| $Mix_1$ + S · 3Aq(α) | |
| −37.8E | 0.237 |
| $Mix_1$ + S · 2.5Aq | |
| −42.3mE | 0.244 |
| S · 3.5Aq + S · 3Aq(β) | |
| −44.3mE | 0.238 |
| S · 3Aq(α) + S · 2.5Aq | |
| −37EU | 0.250 |
| S · 3Aq(α) + S · 2Aq | |
| −39.4mE | 0.274 |
| S · 3Aq(β) + S · 2.5Aq | |
| −43.7mE | 0.242 |
| S · 3Aq(β) + S · 2Aq | |
| −46.5mE | 0.266 |
| S · 2.5Aq + S · 2Aq | |
| −29.8E | 0.288 |
| S · 2Aq + S · Aq | |
| −23.5E | 0.365 |
| S | |
| **−112** | 1.00 |

† Mixed crystals with compn. given in *x* scale.

**HBr** (15)

| *t*, °C | M |
|---|---|
| S · 2Aq | |
| −24 | 22.0 |
| −20 | 23.1 |
| −16 | 24.3 |
| −12 | 26.4 |
| **−11.3** | 27.8 |
| −12 | 30.0 |
| −14 | 32.6 |
| S · 2Aq + S · Aq | |
| −15.5E | 34.0 |
| S · Aq | |
| −12 | 35.4 |
| − 8 | 37.8 |
| − 4 | 43.8 |

**HI** (395)

| | |
|---|---|
| S · 4Aq | |
| −70 | 8.56 |
| −60 | 9.20 |
| −50 | 10.20 |
| −40 | 11.70 |
| **−36.0** | 13.88 |
| −40 | 15.66 |
| −45 | 16.64 |
| S · 4Aq + S · 3Aq | |
| −48.5E | 17.20 |
| S · 3Aq | |
| **−48.1** | 18.50 |
| −50 | 20.28 |
| S · 3Aq + S · 2Aq | |
| −55E | 21.4 |
| S · 2Aq | |
| −50 | 23.1 |
| −45 | 24.7 |

**$HIO_3$** (197, 316)

| *t*, °C | M ± 3% |
|---|---|
| $HIO_3$ | |
| −14 | 15.2 |
| 0 | 16.3 |
| +20 | 18.0 |

**$HIO_3$.**—*(Continued)*

| *t*, °C | M ± 3% |
|---|---|
| $HIO_3$ | |
| 40 | 20.1 |
| 60 | 22.8 |
| 80 | 26.5 |
| 100 | 32.5 |
| $HIO_3$ + $HI_3O_8$ | |
| 110U | 36.3 |
| $HI_3O_8$ | |
| 120 | 37.6 |
| 140 | 42.7 |
| 160 | 53.9 |

**$H_2SO_3$** (13)

| *t*, °C | M |
|---|---|
| S · 6Aq | |
| 0 | 1.87 |
| 2 | 2.17 |
| 4 | 2.55 |
| 6 | 3.12 |
| 8 | 4.00 |
| 10 | 5.24 |
| **12.1** | 7.93 |

**$H_2SO_4$** (61, 129, 185, 258, 309, 389, 390, 391, 492)

| *t*, °C | *x* |
|---|---|
| S · 4Aq | |
| −70 | 0.102 |
| −50 | 0.129 |
| −30 | 0.175 |
| −25 | 0.194 |
| **−24.5** | 0.200 |
| −30 | 0.225 |
| −35 | 0.241 |
| −45 | 0.269 |
| S · 4Aq + S · 2Aq | |
| −50E | 0.281 |
| S · 2Aq | |
| −45 | 0.288 |
| −40 | 0.310 |
| **−38.9** | 0.333 |
| −40 | 0.350 |
| S · 2Aq + S · Aq | |
| −41E | 0.355 |
| S . Aq | |
| −40 | 0.355 |
| −20 | 0.370 |
| −10 | 0.390 |
| 0 | 0.423 |
| + 5 | 0.450 |
| **8.5** | 0.500 |
| 5 | 0.553 |
| 0 | 0.588 |
| −10 | 0.636 |
| −20 | 0.672 |
| −30 | 0.703 |
| S · Aq + S | |
| −38E | 0.723 |
| S | |
| −35 | 0.732 |
| −25 | 0.770 |
| −15 | 0.815 |
| − 5 | 0.870 |
| 0 | 0.905 |
| + 5 | 0.944 |
| **10.4** | 1.000 |

**$H_2SeO_4$** (270)

| *t*, °C | *x* |
|---|---|
| S · 4Aq | |
| −60 | 0.145 |
| −55 | 0.161 |
| **−52** | 0.200 |
| −55 | 0.250 |
| S · 4Aq + S · Aq | |
| −57.2E | 0.270 |
| S · Aq | |
| −50 | 0.276 |
| −40 | 0.286 |
| −20 | 0.311 |
| 0 | 0.346 |
| +20 | 0.410 |
| 25 | 0.453 |
| **26** | 0.500 |
| 25 | 0.520 |
| 20 | 0.560 |
| S · Aq + S | |
| 14.7E | 0.590 |
| S | |
| 20 | 0.600 |
| 30 | 0.631 |
| 40 | 0.693 |
| 50 | 0.810 |
| 60 | 1.000 |

**$H_2TeO_4$** (354)

| *t*, °C | M ± 2% |
|---|---|
| S · 6Aq | |
| 0 | 0.84 |
| 5 | 1.19 |
| 10 | 1.75 |
| 15m | 2.52 |
| S · 6Aq + S · 2Aq | |
| 10.5U | 1.82 |
| S · 2Aq | |
| 10m | 1.80 |
| 20 | 2.16 |
| 30 | 2.53 |
| 40 | 2.95 |
| 60 | 3.92 |
| 80 | 5.51 |
| 100 | 8.06 |

**$NH_3$** (136, 439)

*v. also* p. 251

| *t*, °C | *x* |
|---|---|
| S | |
| −77.8 | 1.000 |
| −80 | 0.964 |
| −84 | 0.904 |
| −88 | 0.857 |
| −92 | 0.820 |
| S + S · 0.5Aq | |
| −93.4E | 0.809 |
| S · 0.5Aq | |
| −92 | 0.803 |
| −88 | 0.782 |
| −84 | 0.754 |
| −80 | 0.706 |
| **−78.8** | 0.667 |
| −80 | 0.636 |
| −82 | 0.616 |
| −86 | 0.588 |
| S · 0.5Aq + S · Aq | |
| −88E | 0.576 |

**$NH_3$.**—*(Continued)*

| *t*, °C | *x* |
|---|---|
| S · Aq | |
| −86 | 0.566 |
| −82 | 0.544 |
| −80 | 0.524 |
| **−79.3** | 0.500 |
| −80 | 0.477 |
| −90 | 0.400 |
| −95 | 0.375 |

**$HNO_3$** (280, 392)

| | |
|---|---|
| S · 3Aq | |
| −45 | 0.123 |
| −35 | 0.143 |
| −25 | 0.177 |
| −20 | 0.209 |
| **−18.3** | 0.250 |
| −20 | 0.289 |
| −25 | 0.327 |
| −30 | 0.354 |
| −40 | 0.396 |
| S · 3Aq + S · Aq | |
| −42.2E | 0.404 |
| S · Aq | |
| −40 | 0.428 |
| −38 | 0.464 |
| **−37.3** | 0.500 |
| −38 | 0.537 |
| −40 | 0.570 |
| −50 | 0.648 |
| −60 | 0.693 |
| S · Aq + S | |
| −67.3E | 0.720 |
| S | |
| −60 | 0.760 |
| −50 | 0.839 |
| **−41.3** | 1.000 |

**$NH_4NO_3$** (99, 106, 151, 200, 202, 331, 348, 351, 426, 455, 513)

| *t*, °C | *x* ± 2% |
|---|---|
| S(α) | |
| −20 | 0.130 |
| −10 | 0.174 |
| 0 | 0.218 |
| +10 | 0.262 |
| 20 | 0.305 |
| 30 | 0.349 |
| S(α) + S(β) | |
| 32.3U | 0.358 |
| S(β) | |
| 40 | 0.392 |
| 60 | 0.484 |
| 80 | 0.590 |
| S(β) + S(γ) | |
| 84U | 0.613 |
| S(γ) | |
| 90 | 0.646 |
| 100 | 0.700 |
| S(γ) + S(δ) | |
| 125U | 0.837 |
| S(δ) | |
| 140 | 0.895 |
| 160 | 0.968 |
| **169** | 1.000 |

**$N_2H_4.HNO_3$ (471)** Basic hydrazine nitrate

| $t$, °C | $x$ |
|---|---|
| S | |
| 10 | 0.250 |
| 20 | 0.335 |
| 25 | 0.383 |
| 30 | 0.433 |
| 40 | 0.538 |
| 50 | 0.663 |
| 60 | 0.796 |

**$NH_4NO_3.2HNO_3$ (196)**

| S | |
|---|---|
| −10 | 0.38 |
| − 5 | 0.41 |
| 0 | 0.45 |
| + 5 | 0.49 |
| 10 | 0.54 |
| 15 | 0.62 |
| 20 | 0.70 |
| 25 | 0.82 |
| **29.5** | 1.00 |

**$NH_4Cl$ (3, 8, 20, 40, 84, 106, 139, 149, 199, 202, 315, 317, 327, 334, 338, 339, 363, 424, 426, 441, 443*, 447, 450, 451, 454, 500, 501)**

| $t$, °C | M ± 1% |
|---|---|
| S + Ice | |
| −15.4 | 4.58 |
| S | |
| −15 | 4.60 |
| 0 | 5.55 |
| +10 | 6.22 |
| 15 | 6.58 |
| 20 | 6.97 |
| 25 | 7.38 |
| 30 | 7.78 |
| ↓70 | 11.20 |
| 80 | 12.15 |
| 90 | 13.2 |
| 100 | 14.2 |

* Gives the equation, $-\log x = 464.5/T - 0.5400$ from 163 to 184.5°; and $-\log x = 327.8/T - 0.2412$ from 184.5 to 205°, U at 184.5°.

**$NH_4ClO_4$ (80, 493)**

| $t$, °C | M ± 5% |
|---|---|
| S | |
| 0 | 1.10 |
| 20 | 1.99 |
| 40 | 3.12 |
| 60 | 4.38 |
| 80 | 5.77 |
| 100 | 7.41 |
| 110 | 8.35 |

**$NH_4Br$ (135, 200, 468)**

| $t$, °C | M ± 2% |
|---|---|
| S($\alpha$) | |
| −20 | 4.61 |
| 0 | 6.10 |
| +20 | 7.71 |
| 40 | 9.38 |
| 60 | 11.01 |
| 80 | 12.87 |

**$NH_4Br$.**—(*Continued*)

| $t$, °C | M ± 2% |
|---|---|
| S($\alpha$) | |
| 100 | 14.90 |
| 120 | 17.11 |
| S($\alpha$) + S($\beta$) | |
| 137.3U | 19.44 |
| S($\beta$) | |
| 140 | 19.67 |
| 150 | 20.66 |
| 160 | 21.78 |
| 165 | 22.38 |

**$NH_4I$ (118, 200, 469)**

| S | |
|---|---|
| −27.4 | 9.24 |
| 0 | 10.51 |
| +20 | 11.73 |
| 40 | 13.06 |
| ↓100 | 17.37 |
| ↓140 | 20.62 |

**$NH_4IO_3$ (316)**

| $t$, °C | M |
|---|---|
| S | |
| 30 | 0.227 |

**$NH_4IO_4$ (23)**

| | |
|---|---|
| 16 | 0.129 |

**$N_2H_4.H_2SO_4$ (472)** Hydrazine sulfate

| S | |
|---|---|
| 20 | 0.210 |
| 25 | 0.254 |
| 30 | 0.305 |
| 50 | 0.546 |
| 60 | 0.704 |
| 70 | 0.882 |
| 80 | 1.105 |

**$(NH_4)_2SO_4$ (46, 58, 81, 345, 424, 426, 447, 451, 452, 453, 472, 513, 522)**

| $t$, °C | M ± 1% |
|---|---|
| S | |
| −20 | 5.01 |
| 0 | 5.35 |
| +10 | 5.53 |
| 20 | 5.73 |
| 25 | 5.82 |
| 30 | 5.91 |
| ↓40 | 6.15 |
| ↓70 | 6.94 |
| 80 | 7.24 |
| 100 | 7.82 |

**$(NH_4)_2S_2O_6$ (11)**

| $t$, °C | M |
|---|---|
| S · 0.5Aq | |
| 0 | 6.80 |
| 20 | 8.47 |
| 30 | 9.31 |

**$(N_2H_4)_2.H_2SO_4$ (472)** Basic hydrazine sulfate

| S · Aq | |
|---|---|
| 25 | 12.5 |
| 35 | 15.3 |
| 45 | 22.6 |
| S · Aq + S | |
| 47.3U | 27.6 |

**$(N_2H_4)_2.H_2SO_4$.**—(*Continued*)

| $t$, °C | M |
|---|---|
| S | |
| 50 | 28.7 |
| 55 | 31.0 |
| 60 | 34.2 |

**$H_3PO_4$ (184, 470)**

| $t$, °C | $x$ |
|---|---|
| S · 0.5Aq | |
| −20 | 0.373 |
| −10 | 0.386 |
| 0 | 0.403 |
| +10 | 0.431 |
| 20 | 0.484 |
| 25 | 0.534 |
| 27 | 0.594 |
| **29.35** | 0.667 |
| 27 | 0.704 |
| 25 | 0.750 |
| S · 0.5Aq + S · 0.1Aq | |
| 23.7E | 0.766 |
| S · 0.1Aq | |
| 24 | 0.767 |
| 25 | 0.779 |
| 26 | 0.801 |
| S · 0.1Aq + S | |
| 26.3U | 0.812 |
| S | |
| 27 | 0.814 |
| 30 | 0.824 |
| 35 | 0.862 |
| 40 | 0.935 |
| **42.3** | 1.0 |
| S · 0.5Aq (435) | |
| −80 | 0.242 |
| −60 | 0.270 |
| −40 | 0.305 |
| S · 0.5Aq + S | |
| 23.5E | 0.766 |
| S | |
| 23.5 | 0.766 |
| 25 | 0.777 |
| 30 | 0.825 |
| 35 | 0.885 |
| 40 | 0.962 |
| 42.35 | 1.000 |
| No S · 0.1Aq | |

**$H_4P_2O_7$ (184)**

| $t$, °C | M |
|---|---|
| S · 1.5Aq | |
| **26** | 0.400 |

**$H_4P_2O_7$.**—(*Continued*)

| $t$, °C | M |
|---|---|
| S | |
| **61** | 1.00 |

**$NH_4H_2PO_4$ (71, 111)**

| $t$, °C | M ± 5% |
|---|---|
| S | |
| 0 | 1.94 |
| 20 | 3.26 |
| 40 | 4.86 |
| 60 | 7.12 |
| 80 | 10.4 |
| 100 | 14.6 |

**$(NH_4)_2HPO_4$ (71, 111)**

| $t$, °C | M ± 10% |
|---|---|
| S | |
| 0 | 3.3 |
| ↓20 | 4.5 |
| ↓70 | 7.1 |

**$(NH_4)_3PO_4$ (111)**

| $t$, °C | M |
|---|---|
| S · 3Aq | |
| 25 | 1.19 |

**$SbF_3$ (430)**

| S | |
|---|---|
| 0 | 21.5 |
| 20 | 25.2 |
| 25 | 27.6 |
| 30 | 31.6 |

**$SbCl_3$ (32, 120)**

| $t$, °C | $x$ |
|---|---|
| S | |
| 0 | 0.327 |
| 10 | 0.367 |
| 20 | 0.412 |
| 30 | 0.463 |
| 40 | 0.525 |
| 50 | 0.620 |
| 60 | 0.746 |
| 70 | 0.945 |
| **72** | 1.00 |

**$(NH_4)_3SbS_4$ (127)**

| $t$, °C | M |
|---|---|
| S · 4Aq | |
| −13.4 | 2.33 |
| 0 | 2.34 |
| +10 | 2.50 |
| 20 | 2.94 |
| 30 | 3.93 |

NOTE.—The following list of carbon compounds includes only salts. For organic acids and bases, *v.* p. 250.

**$NH_4HCO_2$ (195)**; Formate

| $t$, °C | M |
|---|---|
| S | |
| 0 | 16.3 |
| 20 | 22.7 |
| 40 | 32.5 |
| 60 | 48.4 |
| 80 | 86.8 |
| 100 | 222.0 |
| **116** | ∞ |

**$NH_4HCO_3$ (122, 149, 151, 490, 500, 501)**

| $t$, °C | M ± 5% |
|---|---|
| S | |
| 0 | 1.50 |
| 10 | 2.02 |
| 20 | 2.66 |
| 30 | 3.42 |
| 40 | 4.30 |

**$NH_4HCO_2.H_2CO_2$ (195)**
Formate

| $t$, °C | M |
|---|---|
| | S |
| −5 | 40.9 |
| 0 | 51.0 |
| +5 | 67.3 |
| 10 | 93.7 |

**$(NH_4)_2CO_3$ (338, 339)**

| | S |
|---|---|
| 0 | 5.8(?) |
| 15 | 6.5(?) |

**$(NH_4)_2C_2O_4$ (102, 138, 165); *cf.* (539)**
Oxalate

| $t$, °C | M ± 3% |
|---|---|
| | S · Aq |
| 0 | 0.179 |
| 10 | 0.252 |
| 20 | 0.360 |
| 30 | 0.495 |
| 50 | 0.832 |

**$(NH_4)_2C_4H_4O_8$ (152)**
Dihydroxytartrate

| $t$, °C | M |
|---|---|
| 0 | 0.135 |

**$C_5H_{11}NO_2.HCl$ (479)**
Betaine hydrochloride

| | S |
|---|---|
| 0 | 2.86 |
| 20 | 3.96 |
| ↓ 40 | 5.32 |
| ↓ 80 | 8.48 |

**Perchlorates of Organic Bases (238)**
$t = 15°$

| | M |
|---|---|
| $CH_3NH_3ClO_4$ | 8.4 |
| $(CH_3)_2NH_2ClO_4$ | 14.3 |
| $C_2H_5NH_3ClO_4$ | 14.3 |
| $(CH_3)_3NHClO_4$ | 1.20 |
| $(CH_3)_3(CH_2I)NClO_4$ | 0.105 |
| $(C_2H_5)_2NH_2ClO_4$ | 8.7 |
| $(CH_3)_4NClO_4$ | 0.030 |
| $(CH_3)_3C_2H_5NClO_4$ | 0.58 |
| $(CH_3)_3C_3H_7NClO_4$ | 0.77 |
| $(CH_3)_2(C_2H_5)_2NClO_4$ | 6.7 |
| $(CH_3)_3C_4H_9NClO_4$ | 0.171 |
| $CH_3(C_2H_5)_3NClO_4$ | 1.09 |
| $(C_2H_5)_4NClO_4$ | 0.163 |
| $(CH_3)_3C_5H_{11}NClO_4$ | 0.098 |
| $(CH_3)_3C_6H_5NClO_4$ | 0.75 |
| $(C_2H_5)_3C_3H_7NClO_4$ | 0.32 |

**$C_5H_{11}NO_2.HBr$ (479)**
Betaine hydrobromide

| $t$, °C | M |
|---|---|
| | S |
| 0 | 2.00 |
| 20 | 3.20 |
| ↓ 40 | 4.62 |
| ↓ 100 | 9.84 |

**$(CH_3)_4NI$ (228, 515)**
Tetramethylammonium iodide

| | S |
|---|---|
| 0 | 0.100 |
| 25 | 0.275 |

**$(C_2H_5)_4NI$ (515)**
Tetraethylammonium iodide

| $t$, °C | M |
|---|---|
| | S |
| 0 | 0.714 |
| 25 | 1.783 |

**$C_5H_{11}NO_2.HI$ (479)**
Betaine hydroiodide

| | S |
|---|---|
| 0 | 2.80 |
| 20 | 5.60 |
| ↓ 40 | 8.36 |
| ↓ 80 | 13.86 |

**$(C_5H_{11}NO_2)_2.HI$ (479)**
Betaine hydroiodide, basic

| | S |
|---|---|
| 0 | 0.57 |
| 20 | 1.10 |
| 40 | 1.96 |
| ↓ 60 | 3.02 |
| ↓ 90 | 4.93 |

**$NH_4CNS$ (437)**

| | S |
|---|---|
| 0 | 16.0 |
| 20 | 21.3 |

**$C_5H_{11}NO_2.H_2SO_4$ (479)**
Betaine sulfate

| | S.Aq. |
|---|---|
| 0 | 3.42 |
| 20 | 5.14 |
| ↓ 40 | 7.66 |
| ↓ 70 | 12.24 |

**Isomeric Naphthylamine-disulfonates (154)**
$A = C_{10}H_5NH_2(SO_3)_2$
$t = 20°$
2, 5, 7-isomers

| | M |
|---|---|
| $(NH_4)_2A \cdot 3Aq$ | 6.32 |
| $PbA \cdot 6Aq$ | 1.82 |
| $ZnA \cdot 8Aq$ | 1.77 |
| $CoA \cdot 8Aq$ | 1.16 |
| $NiA \cdot 6Aq$ | 1.53 |
| $MgA \cdot 8Aq$ | 0.82 |
| $CaA \cdot 4Aq$ | 1.97 |
| $SrA \cdot 4Aq$ | 1.08 |
| $BaA \cdot 3Aq$ | 0.67 |
| $NaHA \cdot 4Aq$ | 0.264 |
| $Na_2A \cdot 6Aq$ | 7.49 |
| $KHA \cdot 4Aq$ | 0.078 |
| $K_2A \cdot 2Aq$ | 4.67 |

2, 6, 8-isomers

| | M |
|---|---|
| $(NH_4)_2A \cdot 2Aq$ | 7.03 |
| $PbA \cdot Aq$ | 1.58 |
| $ZnA \cdot 8Aq$ | 1.44 |
| $CoA \cdot 8Aq$ | 1.08 |
| $NiA \cdot 6Aq$ | 1.38 |
| $MgA \cdot 8Aq$ | 0.292 |
| $CaA \cdot 3Aq$ | 1.20 |
| $SrA \cdot 3Aq$ | 0.675 |
| $BaA \cdot 3Aq$ | 0.311 |
| $NaHA \cdot 4Aq$ | 0.248 |
| $Na_2A \cdot 3Aq$ | 4.16 |
| $KHA \cdot 2Aq$ | 0.074 |
| $K_2A \cdot 2Aq$ | 2.78 |

**$C_{12}H_{12}N_2.H_2SO_4$ (42)**
Benzidine sulfate

| $t$, °C | M ± 5% |
|---|---|
| 0 | 0.00017 |
| 20 | 0.00028 |
| 40 | 0.00046 |
| 60 | 0.00067 |
| 80 | 0.00091 |

**$C_{21}H_{22}O_2N_2.C_3H_6O_5S$ (170)**
Strychnine sulfopropionate

| $t$, °C | M |
|---|---|
| | *d*-salt |
| 25 | 0.131 |
| | *l*-salt |
| 25 | 0.784 |

**$(C_{19}H_{22}N_2O)_2.H_2SO_4$ (401)**
Cinchonidine sulfate

| $t$, °C | $x$ |
|---|---|
| | S · 6Aq(?) |
| 75 | 0.0015 |
| 90 | 0.0032 |
| 100 | 0.0128 |
| 110 | 0.0320 |
| 120 | 0.0442 |
| 130 | 0.0563 |
| 140 | 0.071 |
| 150 | 0.101 |
| **153** | 0.143 |
| | S · 6Aq + S · 2Aq |
| 153U | 0.138 |
| | S · 2Aq |
| 155 | 0.145 |
| 165 | 0.184 |
| 170 | 0.21 |
| | S |
| **242** | 1.000 |

**$(C_{20}H_{24}N_2O_2)_2.H_2SO_4$ (401)**
Quinine sulfate

| | S · 7Aq(?) |
|---|---|
| 80 | 0.0004 |
| 100 | 0.0010 |
| 120 | 0.0023 |
| 130 | 0.0122 |
| 135 | 0.0252 |
| 140 | 0.0354 |
| 150 | 0.0480 |
| 155 | 0.075 |
| | S · 7Aq + S · 2Aq |
| 156.2U | 0.0962 |
| | S · 2Aq |
| 160 | 0.104 |
| 170 | 0.152 |
| 175 | 0.24 |
| **176.5** | 0.333 |
| | S |
| **235.2** | 1.000 |

**$NH_4C_7H_5ClNO_5S$ (113)**
Chloronitrotoluene-*m*-sulfonate

| $t$, °C | M |
|---|---|
| 0 | 0.035 |
| 10 | 0.048 |
| 20 | 0.069 |
| 30 | 0.096 |

**$C_5H_{11}NO_2.H_3PO_4$ (479)**
Betaine phosphate

| $t$, °C | M |
|---|---|
| | S |
| 0 | 2.14 |
| 20 | 3.22 |
| ↓ 40 | 5.22 |
| ↓ 80 | 10.24 |

**$(NH_4)_2ZrF_6$ (227)**

| $t$, °C | M* |
|---|---|
| 0 | 0.612 |
| 20 | 1.054 |
| 45 | 1.84 |
| 90 | 2.96 |

* Per 1 soln.

**$(NH_4)_3ZrF_7$ (227)**

| | |
|---|---|
| 0 | 0.361 |
| 20 | 0.551 |
| 45 | 0.787 |

**$SnCl_2$ (140, 173)**

| $t$, °C | M |
|---|---|
| | S · 2Aq |
| 0 | 4.4 |
| 25 | 12.2 |

**$SnI_2$ (532)**

| | S (?) |
|---|---|
| 20 | 0.0265 |
| 30 | 0.0316 |
| 40 | 0.0386 |
| 50 | 0.0472 |
| 60 | 0.0568 |
| 70 | 0.0672 |
| 80 | 0.0785 |
| 90 | 0.0912 |
| 100 | 0.116 |

**$PbCl_2$ (60, 62, 137, 206, 229, 295, 365)**

| $t$, °C | M ± 2% |
|---|---|
| | S |
| 0 | 0.0242 |
| 10 | 0.0297 |
| 20 | 0.0357 |
| 25 | 0.0390 |
| 30 | 0.0427 |
| 40 | 0.0505 |
| 60 | 0.0697 |
| 80 | 0.0932 |
| 100 | 0.1199 |

**$Pb(ClO_3)_2$ (290)**

| $t$, °C | M ± 10% |
|---|---|
| | S |
| 0 | 0.0010 |
| 20 | 0.0028 |
| 40 | 0.0048 |
| 60 | 0.0072 |
| 80 | 0.0097 |
| 100 | 0.0123 |

**$Pb(ClO_3)_2$ (357)**

| $t$, °C | M |
|---|---|
| | S |
| 18 | 4.04 |

**PbFCl (475)**

| $t$, °C | M ± 3% |
|---|---|
| | S |
| 0 | 0.00080 |
| 20 | 0.00128 |
| 40 | 0.00191 |
| 100 | 0.00413 |

**$PbBr_2$ (137, 295)**

| $t$, °C | M ± 2% |
|---|---|
| | S |
| 0 | 0.0124 |
| 10 | 0.0167 |
| 20 | 0.0230 |
| 30 | 0.0313 |
| 40 | 0.0412 |
| 60 | 0.0642 |
| 80 | 0.0913 |
| 100 | 0.1294 |

**$PbI_2$ (118, 137, 150, 292, 295)**

| $t$, °C | M ± 3% |
|---|---|
| | S |
| 0 | 0.00092 |
| 10 | 0.00110 |
| 20 | 0.00139 |
| 30 | 0.00190 |
| 40 | 0.00261 |
| 60 | 0.00441 |
| 80 | 0.00670 |
| 100 | 0.00927 |

**$Pb(IO_3)_2$ (211)**

| $t$, °C | M ± 0.5% |
|---|---|
| | S |
| 25 | 0.0000553 |

**$PbN_6$ (529)**

| $t$, °C | M |
|---|---|
| | S |
| 18 | 0.00080 |
| 70 | 0.00315 |

**$Pb(NO_3)_2$ (106, 145, 147, 148, 150, 186, 275, 327, 414, 447)**

| $t$, °C | M ± 2% |
|---|---|
| | S |
| 0 | 1.217 |
| 10 | 1.43 |
| 20 | 1.66 |
| 25 | 1.80 |
| 30 | 1.94 |
| 100 | 3.79 |

No change was found in M when Pb of at. wt. 206.4 – 207.2 was present (147, 414).

**$PbC_4H_4O_5$ (132)**
*l*-Malate

| $t$, °C | M |
|---|---|
| | S · 2Aq |
| 0 | 0.00044 |
| 10 | 0.00071 |
| 20 | 0.00121 |
| 30 | 0.00194 |
| 40 | 0.00290 |

**$PbC_4H_4O_5$ (132)**
*dl*-Malate

| | |
|---|---|
| | S · Aq |
| 0 | 0.00044 |

**$PbC_4H_4O_6$.—(*Continued*)**

| $t$, °C | M |
|---|---|
| | S · Aq |
| 10 | 0.00062 |
| 20 | 0.00088 |
| 30 | 0.00136 |
| 40 | 0.00178 |

**$PbC_4H_4O_6$ (79, 132)**
*d*-Tartrate

| | |
|---|---|
| | S (79) |
| 0 | 0.000076 |
| 10 | 0.000083 |
| 20 | 0.000092 |
| 30 | 0.000108 |
| 40 | 0.000139 |
| | S (132) |
| 30 | 0.000028 |
| 50 | 0.000057 |
| 70 | 0.000102 |
| 90 | 0.000170 |

**$PbC_4H_4O_6$ (132)**
Racemate

| | |
|---|---|
| | S · 4Aq |
| 0 | 0.000107 |
| 10 | 0.000058 |
| 20 | 0.000072 |
| 30 | 0.000126 |
| 40 | 0.000208 |

**$Pb(CH_3CO_2)_2$ (134, 377)**
Acetate

| $t$, °C | M ± 1% |
|---|---|
| | S · 3Aq |
| 0 | 0.606 |
| 10 | 0.901 |
| 20 | 1.362 |
| 25 | 1.676 |
| 30 | 2.14 |
| 40 | 3.58 |
| 50 | 6.80 |

**$Pb(C_6H_5CO_2)_2$ (380)**
Benzoate

| $t$, °C | M |
|---|---|
| 20 | 0.0035 |
| 30 | 0.0044 |
| 40 | 0.0055 |
| 50 | 0.0070 |

**$PbC_{10}H_5NH_2(SO_3)_2$**
Naphthylaminedisulfonates
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**$Th(SO_4)_2$ (18, 24, 25, 117)** (*See* Fig. 2)

| $t$, °C | M ± 5% |
|---|---|
| | S · 9Aq |
| 0 | 0.0174 |
| 10 | 0.0231 |
| 20 | 0.0324 |
| 30 | 0.0472 |
| 40 | 0.0707 |
| 55m | 0.159 |
| | S · 9Aq + S · 4Aq |
| 43.6U | 0.0813 |
| | S · 8Aq |
| 0m | 0.0236 |
| 10m | 0.0282 |

**$Th(SO_4)_2$.—(*Continued*)**

| $t$, °C | M ± 5% |
|---|---|
| | S · 8Aq |
| 20m | 0.0370 |
| 30m | 0.0520 |
| 40m | 0.0753 |
| 45m | 0.0900 |
| | S · 8Aq + S · 4Aq |
| 43.0mU | 0.0840 |
| | S · 4Aq |
| 40m | 0.095 |
| 45 | 0.077 |
| 50 | 0.060 |
| 60 | 0.039 |
| 70 | 0.026 |
| 75 | 0.022 |

**$Ga_2(SeO_4)_3$ (119)**

| $t$, °C | M |
|---|---|
| | S · 16Aq |
| 25 | 1.01 |

**$NH_4Ga(SO_4)_2$ (119)**

| | |
|---|---|
| | S · 12Aq |
| 25 | 1.10 |

**TlOH (12)**

| $t$, °C | M ± 3% |
|---|---|
| | S |
| 0 | 1.18 |
| 10 | 1.36 |
| 20 | 1.63 |
| 30 | 1.96 |
| 40 | 2.32 |
| $t$, °C | M* |
| 50 | 2.72 |
| 60 | 3.33 |
| 80 | 4.83 |
| 100 | 6.75 |

* Per 1 soln.

**TlCl (36, 53, 178, 229, 364, 365, 366)**

| $t$, °C | M ± 1% |
|---|---|
| | S |
| 0 | 0.0070 |
| 10 | 0.0097 |
| 20 | 0.0138 |
| 30 | 0.0189 |
| 40 | 0.0258 |
| 50 | 0.0340 |
| 60 | 0.0436 |
| 70 | 0.0549 |
| 80 | 0.0675 |
| 90 | 0.0824 |
| 100 | 0.1020 |

**$TlClO_3$ (19, 342, 367)**

| $t$, °C | M ± 4% |
|---|---|
| | S |
| 10 | 0.090 |
| 20 | 0.137 |
| 30 | 0.210 |
| 40 | 0.302 |
| 60 | 0.640 |
| 80 | 1.14 |

**$TlClO_4$ (80)**

| $t$, °C | M |
|---|---|
| | S |
| 0 | 0.197 |

**$TlClO_4$.—(*Continued*)**

| $t$, °C | M |
|---|---|
| | S |
| 10 | 0.265 |
| 20 | 0.415 |
| 30 | 0.630 |
| 40 | 0.910 |
| 60 | 1.72 |
| 80 | 2.68 |

**TlBr (34, 364)**

| $t$, °C | M ± 3% |
|---|---|
| | S |
| 30 | 0.00257 |
| 40 | 0.00392 |
| 50 | 0.0055 |
| 60 | 0.0072 |
| 70 | 0.0092 |

**$TlBrO_3$ (366)**

| $t$, °C | M ± 0.5% |
|---|---|
| | S |
| 39.75 | 0.02234 |

**$Tl_2SO_3$ (35, 460)**

| $t$, °C | M |
|---|---|
| | S |
| 15 | 0.0683 |

**$Tl_2SO_4$ (36, 93, 98, 100, 244, 285, 367, 507); *cf.* (35)**

| $t$, °C | M ± 1% |
|---|---|
| | S |
| 0 | 0.0534 |
| 10 | 0.0730 |
| 20 | 0.0962 |
| 30 | 0.1226 |
| 40 | 0.152 |
| 60 | 0.216 |
| 80 | 0.290 |
| 100 | 0.370 |

**$Tl_2(SO_4)_3.Tl_2SO_4$ (35)**

**$Tl_2(SO_4)_3.(Tl_2SO_4)_5$ (35)**

**$TlOHSO_4.2H_2O$ (35)**

**$Tl_2SeO_4$ (187, 507)**

| $t$, °C | M ± 3% |
|---|---|
| | S |
| 10 | 0.040 |
| 20 | 0.051 |
| 30 | 0.064 |
| 40 | 0.080 |
| 60 | 0.114 |
| 80 | 0.154 |
| 100 | 0.197 |

**$TlNO_3$ (36, 144)**

| | |
|---|---|
| | S |
| 0 | 0.149 |
| 10 | 0.239 |
| 20 | 0.353 |
| 30 | 0.535 |
| 40 | 0.795 |
| 50 | 1.27 |
| 60 | 1.73 |
| 70 | 2.62 |
| 80 | 4.22 |
| 90 | 7.5 |
| 100 | 15.3 |
| 104.5 | 22.3 |

**$Tl_2CO_3$ (285)**

| $t$, °C | M ± 10% |
|---|---|
| S | |
| 10 | 0.094 |
| 20 | 0.118 |
| 30 | 0.147 |
| 40 | 0.183 |
| 60 | 0.267 |
| 80 | 0.363 |
| 100 | 0.472 |

**$Tl_2C_2O_4$ (206)**

Oxalate

| $t$, °C | M ± 0.2% |
|---|---|
| S | |
| 25 | 0.03755 |

**$TlC_6H_2N_3O_7$ (403)**

Picrate

| $t$, °C | M ± 1% |
|---|---|
| S (red) | |
| 0 | 0.00312 |
| 10 | 0.00560 |
| 20 | 0.00908 |
| 25 | 0.0110 |
| 30 | 0.0133 |
| 40 | 0.0189 |
| S (red) + S (yellow) | |
| 46.1U | 0.0248 |
| S (yellow) | |
| 45 | 0.0241 |
| 50 | 0.0280 |
| 60 | 0.0390 |
| 70 | 0.0562 |

**TlCNS (364, 366)**

| | |
|---|---|
| 25 | 0.01494 |
| 39.75 | 0.02795 |

**$ZnCl_2$ (356)** (*See* Fig. 3)

| $t$, °C | M ± 3% |
|---|---|
| S · 4Aq | |
| −60 | 7.6 |
| −50 | 8.3 |
| −40 | 9.3 |
| S · 3Aq | |
| −10 | 13.9 |
| 0 | 15.3 |
| + 5 | 16.9 |
| **6.5** | 18.5 |
| 5m | 20.7 |
| S · 2.5Aq | |
| 0 | 17.3 |
| 5 | 18.1 |
| 10 | 19.9 |
| **12.5** | 22.2 |
| 10m | 25.7 |
| 6m | 28.3 |
| S · 1.5Aq | |
| − 5m | 22.2 |
| 0m | 22.7 |
| +10m | 24.3 |
| 20 | 27.0 |
| 25 | 30.0 |
| S · Aq | |
| 0m | 25.1 |
| 10m | 26.7 |

**$ZnCl_2$.**—(*Continued*)

| $t$, °C | M ± 3% |
|---|---|
| S · Aq | |
| 20m | 29.1 |
| 25m | 30.6 |
| 30 | 33.5 |
| S | |
| 25m | 31.7 |
| 30 | 32.2 |
| 40 | 33.2 |
| 60 | 35.8 |
| 80 | 39.8 |
| 100 | 45.1 |
| 262 | ∞ |
| S · 4Aq + S · 3Aq | |
| −30U | 11.7 |
| S · 3Aq + S · 2.5Aq | |
| 6.5EU | 18.5 |
| S · 3Aq + S · 1.5Aq | |
| 0mE | 22.7 |
| S · 2.5Aq + S · 1.5Aq | |
| 11.5E | 24.6 |
| S · 2.5Aq + S · Aq | |
| 9mE | 26.4 |
| S · 1.5Aq + S · Aq | |
| 26U | 31.0 |
| S · 1.5Aq + S | |
| 26.3mU | 31.8 |
| S · Aq + S | |
| 28U | 32.0 |

**$Zn(ClO_3)_2$ (323, 357)**

| | |
|---|---|
| S · 6Aq | |
| −20 | 5.36 |
| 0 | 6.10 |
| +10 | 7.11 |
| 15 | 8.00 |
| S · 6Aq + S · 4Aq | |
| 17.3U | 8.53 |
| S · 4Aq | |
| 20 | 8.62 |
| 30 | 9.00 |
| 40 | 9.62 |
| 50 | 10.96 |
| 55 | 13.3 |

**$ZnBr_2$ (123)**

| $t$, °C | M ± 2% |
|---|---|
| S · 3Aq | |
| −15 | 14.96 |
| −10 | 16.24 |
| − 5m | 18.46 |
| S · 3Aq + S · 2Aq | |
| − 8.7U | 16.70 |
| S · 2Aq | |
| −10m | 16.64 |
| 0 | 17.26 |
| +10 | 18.34 |
| 20 | 19.82 |
| 30 | 22.26 |
| 35 | 24.84 |
| 37m | 27.75 |
| S · 2Aq + S | |
| 36.1U | 26.04 |
| S | |
| 35m | 26.00 |
| ↓ 95 | 29.52 |

**$ZnI_2$ (123)**

| $t$, °C | M ± 3% |
|---|---|
| S · 2Aq | |
| −10 | 13.00 |
| 0 | 13.41 |
| +10m | 14.14 |
| 20m | 15.59 |
| 25m | 17.1 |
| 28m | 18.5 |
| S · 2Aq + S | |
| 0.5U | 13.45 |
| S | |
| - 5m | 13.43 |
| 0m | 13.45 |
| +15 | 13.52 |
| 30 | 13.72 |
| 45 | 14.12 |
| 100 | 15.94 |

**$ZnSO_4$ (70, 74, 75, 92, 95, 106, 144, 199, 480)** (*See* Fig. 4)

| $t$, °C | M ± 0.2% |
|---|---|
| S · 7Aq(rhomb) | |
| − 5 | 2.434 |
| 0 | 2.595 |
| + 5 | 2.760 |
| 10 | 2.952 |
| 15 | 3.151 |
| 20 | 3.358 |
| 25 | 3.588 |
| 30 | 3.844 |
| 35 | 4.11 |
| S · 7Aq(rhomb) + S · 6Aq | |
| 39U | 4.34 |
| S · 7Aq(monocl) | |
| − 5m | 2.916 |
| 0m | 3.06 |
| + 5m | 3.220 |
| 10m | 3.37 |
| 15m | 3.535 |
| 20m | 3.715 |
| S · 7Aq(monocl) + S · 6Aq | |
| 25mU | 3.940 |
| S · 6Aq | |
| 10m | 3.635 |
| 20m | 3.832 |
| 30m | 4.07 |
| 40 | 4.36 |
| 50 | 4.76 |
| 60 | 5.27 |
| S · Aq(?) | |
| 100 | 5.0* |
| 125 | 4.2* |

* ±10 %.

**$Zn(NO_3)_2$ (174, 357)**

| $t$, °C | M ± 2% |
|---|---|
| S · 9Aq | |
| −25 | 3.53 |
| −20 | 3.86 |
| S · 9Aq + S · 6Aq | |
| −16.6U | 4.30 |
| S · 6Aq | |
| −15 | 4.37 |
| −10 | 4.58 |
| 0 | 5.00 |
| +10 | 5.55 |

**$Zn(NO_3)_2$.**—(*Continued*)

| $t$, °C | M ± 2% |
|---|---|
| S · 6Aq | |
| 20 | 6.23 |
| 30 | 7.29 |
| 35 | 8.30 |
| **36.4** | 9.24 |
| 35 | 9.88 |
| 33 | 10.23 |
| S · 6Aq + S · 3Aq | |
| 34E | 10.03 |
| S · 3Aq | |
| 35 | 10.14 |
| 40 | 11.00 |
| 45 | 13.00 |
| 45.5 | 18.47 |

**$ZnSO_4.(NH_4)_2SO_4$ (299)**

| $t$, °C | M |
|---|---|
| S · 6Aq | |
| 25 | 0.48 |

**$ZnC_4H_4O_6$ (79)**

Tartrate

| | |
|---|---|
| S · 2Aq | |
| ↓ 15 | 0.0009 |
| ↓ 30 | 0.0022 |
| 40 | 0.0030 |
| 50 | 0.0038 |
| 60 | 0.0046 |
| S · 2Aq + S · $x$Aq | |
| 63U(?) | 0.0048(?) |
| S · $x$Aq | |
| ↓ 60m | 0.0051 |
| ↓ 0 | 0.0018 |

**$Zn(C_6H_5CO_2)_2$ (380)**

Benzoate

| | |
|---|---|
| 15 | 0.086 |
| 20 | 0.080 |
| 30 | 0.069 |
| 40 | 0.060 |
| 50 | 0.053 |
| 60 | 0.047 |

**$ZnC_{10}H_5NH_2(SO_3)_2$**

Naphthylaminedisulfonates

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**$Tl_2Zn(SO_4)_2$ (299)**

| $t$, °C | M |
|---|---|
| S · 6Aq | |
| 25 | 0.129 |

**$CdF_2$ (248)**

| | |
|---|---|
| 25 | 0.29 |

**$CdCl_2$ (123, 144)** (*See* Fig. 5)

| $t$, °C | M ± 3% |
|---|---|
| S · 4Aq | |
| −10 | 4.12 |
| 0m | 5.33 |
| +10m | 6.83 |
| 15m | 7.89 |
| S · 4Aq + S · 2.5Aq | |
| − 6U | 4.60 |
| S · 4Aq + S · Aq | |
| 13mU | 7.38 |
| S · 2.5Aq | |
| −10m | 4.35 |
| 0 | 4.95 |

$CdCl_2$.—(*Continued*)

| *t*, °C | M ± 3% |
|---|---|
| S · 2.5Aq | |
| +10 | 5.55 |
| 20 | 6.22 |
| 30 | 7.00 |
| 40m | 7.9 |
| S · 2.5Aq + S · Aq | |
| 34.1U | 7.40 |
| S · Aq | |
| 10m | 7.38 |
| 30m | 7.39 |
| 40 | 7.40 |
| 60 | 7.47 |
| 80 | 7.66 |
| 100 | 8.04±5% |
| 120 | 8.8 ± 5% |
| 140 | 9.8 ± 5% |

$Cd(ClO_3)_2$ (323)

| S · 2Aq | |
|---|---|
| −20 | 12.4 |
| 0 | 14.1 |
| +20 | 15.9 |
| 40 | 18.1 |
| 60 | 21.4 |
| 65 | 23.4 |

$CdBr_2$ (123, 144)

| S · 4Aq | |
|---|---|
| 0 | 2.20 |
| 10 | 2.82 |
| 20 | 3.76 |
| 30 | 4.86 |
| 40m | 6.3 |
| S · 4Aq + S · Aq | |
| 35.8U | 5.60 |
| S · Aq | |
| 40 | 5.62 |
| 120 | 6.02 |

$CdI_2$ (94, 96, 123, 144)

| *t*, °C | M ± 1% |
|---|---|
| S | |
| 0 | 2.155 |
| 10 | 2.230 |
| 20 | 2.312 |
| 30 | 2.404 |
| 40 | 2.506 |
| 60 | 2.77 |
| 80 | 3.09 |
| 100 | 3.48 |
| 120 | 3.96 |
| 140 | 4.74 |
| *t*, °C | M ± 0.1% |
| 0.00 | 2.155 |
| 15.00 | 2.269 |
| 20.00 | 2.312 |
| 22.50 | 2.333 |
| 25.00 | 2.356 |
| 27.50 | 2.379 |
| 30.00 | 2.404 |
| 32.50 | 2.427 |
| 35.00 | 2.453 |
| 37.50 | 2.480 |
| 40.00 | 2.506 |

$CdSO_4$ (101, 260, 266, 358, 477)

| *t*, °C | M ± 3% |
|---|---|
| S · 7Aq | |
| −20m | 3.80 |
| −10m | 4.06 |
| − 5m | 4.51 |
| *t*, °C | M ± 0.1% |
| S · ⅝Aq | |
| −15 | 3.616 |
| 0 | 3.620 |
| +10 | 3.639 |
| 20 | 3.667 |
| 25 | 3.683 |
| *t*, °C | M ± 2% |
| 30 | 3.71 |
| 40 | 3.76 |
| 50 | 3.83 |
| 60 | 3.92 |
| 70 | 4.08 |
| S · ⅝Aq + S | |
| 74.5U | 4.25 |
| S | |
| 75 | 3.85 |
| 80 | 3.34 |
| 85 | 3.14 |
| 90 | 3.03 |
| 100 | 2.92 |

$Cd(NO_3)_2$ (174)

| *t*, °C | M ± 3% |
|---|---|
| S · 9Aq | |
| −12 | 2.60 |
| − 4 | 3.27 |
| 0 | 4.11 |
| + 1m | 4.72 |
| **2m** | 6.17 |
| S · 9Aq + S · 4Aq | |
| 0.9U | 4.67 |
| S · 4Aq | |
| 0m | 4.64 |
| 10 | 5.00 |
| 20 | 5.44 |
| 30 | 5.96 |
| 40 | 6.75 |
| 50 | 8.2 |
| 55 | 9.7 |
| **59.5** | 13.88 |

$CdCl_2.NH_4Cl$ (421)

| *t*, °C | M |
|---|---|
| S | |
| 0 | 1.78 |
| 20 | 2.20 |
| 40 | 2.70 |
| 60 | 3.22 |
| 80 | 3.70 |
| 100 | 4.40 |

$CdBr_2.NH_4Br$ (422)

| S | |
|---|---|
| 0 | 3.13 |
| 10 | 3.31 |
| 20 | 3.62 |
| 30 | 4.00 |
| 40 | 4.45 |
| 50 | 4.96 |
| 75 | 6.35 |
| 100 | 7.90 |

$CdBr_2.4NH_4Br$ (422)

| *t*, °C | M |
|---|---|
| S | |
| 160 | 9.9 |

$CdSO_4.(NH_4)_2SO_4$ (299)

| S · 6Aq | |
|---|---|
| 25 | 2.14 |

HgO (177, 240, 446)

| *t*, °C | M ± 3% |
|---|---|
| 25 | 0.000233 |

$HgCl_2$ (124, 160, 201, 225, 337, 341, 374, 398, 457, 461, 497, 502)

| *t*, °C | M ± 10% |
|---|---|
| 0 | 0.170 |
| 10 | 0.204 |
| 20 | 0.246 |
| 30 | 0.300 |
| 40 | 0.366 |
| 50 | 0.466 |
| 60 | 0.554 |
| 70 | 0.714 |
| 80 | 0.98 |
| 90 | 1.41 |
| 100 | 2.06 |

$HgBr_2$ (223, 225, 335, 461)

| *t*, °C | M ± 1% |
|---|---|
| 25 | 0.0170 |

$HgI_2$ (223)

| *t*, °C | M |
|---|---|
| S | |
| 25 | 0.00013 |

$Hg_2SO_4$ (131)

| S | |
|---|---|
| 25 | 0.00117 |

$HgCH_3CO_2$ (283)

| Acetate | |
|---|---|
| 21 | 0.00395 |

$Hg(CN)_2$ (223, 261, 461)

| S | |
|---|---|
| 20 | 0.376 |
| 25 | 0.445 |

$CuCl_2$ (140, 144, 317, 407, 425, 450, 451, 457)

| *t*, °C | M ± 2% |
|---|---|
| S · 2Aq | |
| −20 | 4.53 |
| +20 | 5.58 |
| 25 | 5.70 |
| 70 | 6.96 |
| 90 | 7.56 |

$Cu(ClO_3)_2$ (51,* 323)

| *t*, °C | M ± 3% |
|---|---|
| S · 4Aq | |
| −30 | 5.26 |
| −20 | 5.58 |
| −10 | 5.88 |
| 0 | 6.22 |
| +10 | 6.62 |
| 20 | 7.06 |
| 30 | 7.60 |
| 40 | 8.18 |
| 50 | 8.94 |
| 60 | 9.94 |

$Cu(ClO_4)_2$.—(*Continued*)

| *t*, °C | M ± 3% |
|---|---|
| S · 4Aq | |
| **71.05** | 13.88 |
| 71 | 14.14 |

* Found S · 6Aq, M. P. 65°.

$CuSO_4$ (81, 91, 95, 106, 144, 164, 199, 221, 311, 318, 386, 447, 450, 451, 480, 495, 496, 504)

| *t*, °C | M ± 2% |
|---|---|
| S · 5Aq (α) | |
| − 1.6 | 0.85 |
| 0 | 0.88 |
| + 10 | 1.08 |
| 20 | 1.30 |
| 25 | 1.408 |
| 30 | 1.53 |
| 40 | 1.80 |
| 50 | 2.09 |
| S · 5Aq (α) + S · 5Aq (β) | |
| 56U | 2.29 |
| S · 5Aq(β) | |
| 60 | 2.44 |
| 70 | 2.84 |
| 80 | 3.39 |
| 90 | 4.22 |
| 100 | 4.72 |
| S · 5Aq + S · 3Aq? | |
| 101U | 4.79 |
| S · 3Aq? | |
| 110 | 4.88 |
| 120 | 4.98 |
| 130 | 5.08 |

$CuS_2O_6$ (11)

| *t*, °C | M |
|---|---|
| S · 4Aq | |
| 0 | 3.49 |
| 10 | 3.56 |
| 20 | 3.64 |
| 30 | 3.73 |

$Cu(NO_3)_2$ (144, 150, 174, 311)

| *t*, °C | M ± 3% |
|---|---|
| S · 9Aq | |
| −23 | 3.01 |
| −20m | 3.69 |
| S · 9Aq + S · 6Aq | |
| −20U | 3.51 |
| S · 6Aq | |
| −10 | 3.88 |
| 0 | 4.37 |
| +10 | 5.18 |
| 20 | 6.56 |
| 25 | 7.95 |
| **26.4m** | 9.25 |
| S · 6Aq + S · 3Aq | |
| 25U | 8.00 |
| S · 3Aq | |
| 30 | 8.15 |
| 40 | 8.52 |
| 50 | 8.98 |
| 60 | 9.55 |
| 70 | 10.25 |
| 80 | 11.08 |
| 100 | 13.28 |
| **114.5** | 18.50 |

**$CuCl_2.2NH_4Cl$ (317)**

| $t$, °C | M ± 2% |
|---|---|
| S · 2Aq | |
| −10 | 1.06 |
| 0 | 1.18 |
| +10 | 1.30 |
| 20 | 1.44 |
| 30 | 1.61 |
| 40 | 1.81 |
| 50 | 2.06 |
| 60 | 2.34 |
| 70 | 2.69 |
| 80 | 3.17 |

**$CuSO_4.(NH_4)_2SO_4$ (81, 447, 451)**

| $t$, °C | M |
|---|---|
| S · 6Aq | |
| 20 | 0.682 |
| 30 | 0.876 |
| 40 | 1.076 |
| 50 | 1.304 |
| 60 | 1.67 |

**$CuC_4H_4O_6$ (79)**
Tartrate

| $t$, °C | M × $10^3$ |
|---|---|
| S · 3Aq | |
| 15 | 1.06 |
| 20 | 2.00 |
| 30 | 4.2 |
| 40 | 6.8 |
| 50 | 9.5 |
| S · 3Aq + S · $x$Aq | |
| 52?U | 10.1? |
| S · $x$Aq | |
| 60 | 9.1 |
| 70 | 7.9 |
| 80 | 6.8 |
| 90 | 5.7 |

**$CuSO_4.Tl_2SO_4$ (299)**

| $t$, °C | M |
|---|---|
| S · 6Aq | |
| 25 | 0.122 |

**$Ag_2O$ (369)**

| S | |
|---|---|
| 25 | 0.000217 |

**AgF (198)** (*See* Fig. 6)

| $t$, °C | $x$ ± 2% |
|---|---|
| S · 4Aq | |
| −15 | 0.0780 |
| − 5 | 0.0974 |
| 0 | 0.110 |
| +10 | 0.146 |
| 18 | 0.186 |
| 19m | 0.200 |
| S · 4Aq + S · 2Aq | |
| 18.65U | 0.194 |
| S · 2Aq | |
| 15m | 0.189 |
| 20 | 0.196 |
| 25 | 0.203 |
| 35 | 0.222 |
| S · 2Aq + S | |
| 39.5U | 0.240 |

**AgF.**—(*Continued*)

| $t$, °C | $x$ ± 2 % |
|---|---|
| S | |
| 40 | 0.240 |
| 60 | 0.234 |
| 80 | 0.230 |
| 100 | 0.226 |
| S · ⅝Aq | |
| 0m | 0.194 |
| 10m | 0.206 |
| 20m | 0.219 |
| 25m | 0.228 |
| S · ⅝Aq + S · Aq | |
| 27mU | 0.233 |
| S · Aq | |
| 15m | 0.230 |
| 25m | 0.232 |
| 35m | 0.238 |
| S · Aq + S | |
| 38.2mU | 0.241 |

**$AgClO_3$ (290)**

| $t$, °C | M ± 5% |
|---|---|
| S | |
| 0 | 0.0097 |
| 10 | 0.0165 |
| 20 | 0.0236 |
| 40 | 0.0397 |
| 60 | 0.061 |
| 80 | 0.088 |
| 100 | 0.123 |

**$AgClO_4$ (230, 231)**

| $t$, °C | M ± 2% |
|---|---|
| S · Aq | |
| 0 | 21.0 |
| ↓ 20 | 25.2 |
| ↓ 30 | 27.7 |
| ↓ 50 | 32.9 |
| S · Aq + S | |
| 50?U | 32.9? |
| S | |
| 60 | 34.1 |
| ↓ 100 | 38.4 |

**$AgBrO_3$ (229, 364, 406)**

| $t$, °C | M ± 1% |
|---|---|
| S | |
| 25 | 0.00830 |
| 30 | 0.00963 |
| 40 | 0.01340 |
| 50 | 0.01836 |
| 60 | 0.0242 |
| 70 | 0.0312 |
| 80 | 0.0397 |
| 90 | 0.0562 |

**$AgIO_3$ (232, 369)**

| $t$, °C | M |
|---|---|
| S | |
| 25 | 0.000181 |

**$Ag_2SO_4$ (24, 145, 206, 232, 436)**

| $t$, °C | M ± 1% |
|---|---|
| S | |
| 10 | 0.0220 |
| 20 | 0.0254 |
| 30 | 0.0283 |
| 50 | 0.0340 |
| 70 | 0.0390 |

**$Ag_2SO_4$.**—(*Continued*)

| $t$, °C | M ± 1% |
|---|---|
| S | |
| 80 | 0.0413 |
| 100 | 0.0453 |

**$AgNO_2$ (2, 109, 294, 362)**

| $t$, °C | M ± 3% |
|---|---|
| S | |
| 0 | 0.0102 |
| 10 | 0.0146 |
| 20 | 0.0222 |
| 25 | 0.0270 |
| 30 | 0.0329 |
| 40 | 0.0466 |
| 50 | 0.0641* |
| 60 | 0.0897* |

* May be in error due to decompn.

**$AgNO_3$ (144, 202, 275, 312, 329, 455, 495)**

| $t$, °C | M ± 2% |
|---|---|
| S | |
| −5 | 5.60 |
| 0 | 6.65 |
| +5 | 7.80 |
| 10 | 9.20 |
| 15 | 10.75 |
| 20 | 12.30 |
| 25 | 14.00 |
| 30 | 15.95 |
| $t$, °C | $x$ ± 10% |
| 40 | 0.259 |
| 50 | 0.30 |
| 75 | 0.41 |
| 100 | 0.51 |
| 125 | 0.62 |
| 150 | 0.73 |

**$AgNO_3.NH_4NO_3$ (455)**

| $t$, °C | M |
|---|---|
| S | |
| 30 | 16.7 |

**$AgCH_3CO_2$ (9, 190, 232, 259, 405)**
Acetate

| $t$, °C | M ± 2% |
|---|---|
| S | |
| 0 | 0.0432 |
| 10 | 0.0522 |
| 20 | 0.0620 |
| 25 | 0.0670 |
| 30 | 0.0726 |
| 40 | 0.0842 |
| 50 | 0.0978 |
| 60 | 0.1130 |
| 70 | 0.1302 |
| 80 | 0.1502 |

**$AgC_2H_5CO_2$ (9, 190, 259, 405)**
Propionate

| S | |
|---|---|
| 0 | 0.0278 |
| 10 | 0.0372 |
| 20 | 0.0460 |
| ↓ 25 | 0.0501 |
| ↓ 50 | 0.0738 |
| 60 | 0.0840 |
| 70 | 0.0960 |
| 80 | 0.1120 |

**$Ag_2C_4H_4O_5$ (384)**
Malate

| $t$, °C | M ± 10% |
|---|---|
| 18 | 0.0034 |
| 25 | 0.0035 |

**$Ag_2C_4H_4O_6$ (384)**
Tartrate

| | |
|---|---|
| 18 | 0.055 |
| 25 | 0.056 |

**$AgC_3H_7CO_2$ (9, 405)**
Butyrate

| $t$, °C | M ± 5% |
|---|---|
| S | |
| 10 | 0.0215 |
| 20 | 0.0249 |
| 30 | 0.0289 |
| 50 | 0.0380 |
| 70 | 0.0492 |
| 80 | 0.0582 |

**$AgC_3H_7CO_2$ (190, 405)**
Isobutyrate

| $t$, °C | M ± 3% |
|---|---|
| S | |
| 0 | 0.038 |
| 10 | 0.044 |
| ↓ 20 | 0.050 |
| ↓ 60 | 0.076 |
| 70 | 0.085 |
| 80 | 0.091 |

**$AgC_4H_9CO_2$ (458)**
Methylethylacetate

| $t$, °C | M |
|---|---|
| S | |
| 10 | 0.0532 |
| 20 | 0.0540 |
| 30 | 0.0566 |
| 40 | 0.0643 |
| 50 | 0.0768 |
| 60 | 0.0876 |
| 70 | 0.1000 |

**$AgC_4H_9CO_2$ (478)**
Trimethylacetate

| S | |
|---|---|
| 0 | 0.0525 |
| 10 | 0.0552 |
| 20 | 0.0584 |
| 30 | 0.0620 |
| 40 | 0.0659 |
| 50 | 0.0700 |
| 60 | 0.0750 |
| 70 | 0.0804 |

**$AgC_4H_9CO_2$ (9, 176)**
Valerate

| S | |
|---|---|
| 0 | 0.0108 |
| 10 | 0.0124 |
| 17 (9) | 0.0094 |
| 20 | 0.0143 |
| 30 | 0.0167 |
| 40 | 0.0195 |
| 50 | 0.0228 |
| 60 | 0.0264 |
| 70 | 0.0304 |

**$AgC_4H_3CO_2$ (458)**
Isovalerate

| $t$, °C | M |
|---|---|
| S | |
| 0 | 0.0085 |
| 10 | 0.0101 |
| 20 | 0.0118 |
| 50 | 0.0172 |
| 70 | 0.0212 |

**$AgC_6H_5CO_2$ (371)**
Benzoate

| | |
|---|---|
| S | |
| 25 | 0.00115 |

**$AgCH_2ClCO_2$ (9, 232)**
Chloroacetate

| | |
|---|---|
| S | |
| 16.9 | 0.0646 |
| 25 | 0.0739 |

**$C_5H_{11}NO_2.HAuCl_4$ (479)**
Betaine chloroaurate

| | |
|---|---|
| S | |
| 0 | 0.035 |
| 20 | 0.060 |
| 40 | 0.126 |
| 60 | 0.250 |
| 80 | 0.416 |
| 90 | 0.507 |

**$2C_5H_{11}NO_2.HAuCl_4$ (479)**
Betaine chloroaurate, basic

| | |
|---|---|
| S · Aq | |
| 0 | 0.0084 |
| 20 | 0.0172 |
| 40 | 0.0420 |
| 80 | 0.114 |

**$OsO_4$ (518)**

| | |
|---|---|
| 20 | 0.254 |

**$(NH_4)_2IrCl_6$ (7, 413)**

| $t$, °C | M ± 5% |
|---|---|
| S | |
| 0 | 0.0118 |
| 10 | 0.0166 |
| 20 | 0.0224 |
| 30 | 0.0286 |
| 40 | 0.0360 |
| 50 | 0.0440 |
| 60 | 0.0550 |
| 70 | 0.0690 |
| 80 | 0.092 |

**$(NH_4)_2PtCl_6$ (7)**

| $t$, °C | M ± 4% |
|---|---|
| S | |
| 0 | 0.0066 |
| 20 | 0.0113 |
| 30 | 0.0144 |
| 40 | 0.0182 |
| 60 | 0.0310 |
| 80 | 0.0500 |
| 100 | 0.0720 |

**$(NH_4)_2PtBr_6$ (7)**

| | |
|---|---|
| S | |
| 0 | 0.0056 |
| 20 | 0.0096 |
| 30 | 0.0118 |
| 40 | 0.0143 |

**$(NH_4)_2PtBr_6$.**—*(Continued)*

| $t$, °C | M ± 4% |
|---|---|
| S | |
| 60 | 0.0213 |
| 80 | 0.0327 |
| 100 | 0.0497 |

**$RuO_4$ (408.5)**

**$MnCl_2$ (115, 144, 416)**

| $t$, °C | M ± 3% |
|---|---|
| S · 4Aq(α) | |
| 0 | 5.04 |
| 10 | 5.47 |
| 20 | 5.93 |
| 30 | 6.42 |
| 40 | 7.04 |
| 50 | 7.77 |
| S · 4Aq(α) + S · 2Aq | |
| 58.09U | 8.63 |
| S · 2Aq | |
| 60 | 8.65 |
| 100 | 9.24 |

**$MnBr_2$ (144, 282)**

| $t$, °C | M ± 10% |
|---|---|
| S · 4Aq* | |
| −20 | 5.1 |
| 0 | 5.8 |
| +20 | 6.6 |
| 40 | 7.7 |
| 60 | 9.5 |
| S · 4Aq + S · Aq | |
| 64U | 10.1 |
| S · Aq | |
| 70 | 10.2 |
| 85 | 10.5 |
| 100 | 10.7 |

* According to (282) S · 6Aq is given as stable form below 13°.

**$MnSO_4$ (107, 411, 456)**
*(See* Fig. 7)

| $t$, °C | M ± 1% |
|---|---|
| S · 7Aq | |
| −10 | 3.18 |
| 0 | 3.53 |
| +10m | 3.97 |
| 15m | 4.31 |
| S · 7Aq + S · 5Aq | |
| 9U | 3.92 |
| S · 7Aq + S · 4Aq | |
| 14mU | 4.20 |
| S · 5Aq | |
| 0m | 3.76 |
| 10 | 3.94 |
| 20 | 4.16 |
| 30m | 4.46 |
| 35m | 4.70 |
| S · 5Aq + S · 4Aq | |
| 27U | 4.36 |
| S · 5Aq + S · Aq | |
| 27U | 4.36 |
| S · 4Aq | |
| 10m | 4.17 |
| 20m | 4.27 |
| 30m | 4.40 |
| 40m | 4.57 |
| 50m | 4.80 |

**$MnSO_4$.**—*(Continued)*

| $t$, °C | M ± 1% |
|---|---|
| S · 4Aq + S · Aq | |
| 27U | 4.36 |
| S · Aq | |
| 20m | 4.49 |
| 30 | 4.31 |
| 40 | 4.10 |
| 50 | 3.85 |
| 60 | 3.60 |
| 70 | 3.32 |
| 80 | 3.02 |
| 90 | 2.52 |
| 100 | 2.39 |

**$Mn(NO_3)_2$ (174)**

| $t$, °C | M ± 2% |
|---|---|
| S · 6Aq | |
| −30 | 4.02 |
| −20 | 4.51 |
| −10 | 5.05 |
| 0 | 5.68 |
| +10 | 6.48 |
| 20 | 7.66 |
| 25 | 8.78 |
| **25.8** | 9.25 |
| 25 | 9.75 |
| S · 6Aq + S · 3Aq | |
| 23.6E | 10.13 |
| S · 3Aq | |
| 25 | 10.34 |
| 30 | 11.5 |
| 35 | 15 |
| **35.5** | 18.5 |

**$MnSO_4.(NH_4)_2SO_4$ (299)**

| $t$, °C | M |
|---|---|
| S · 6Aq | |
| 25 | 1.33 |

**$MnC_2O_4$ (536); Oxalate**

**$C_5H_{11}NO_2.HMnO_4$ (479)**
Betaine permanganate

| | |
|---|---|
| 0 | 0.075 |
| 10 | 0.118 |
| 20 | 0.200 |
| 30 | 0.361 |
| 40 | 0.682 |
| 50 | 1.34 |
| 55 | 1.98 |

**$FeCl_2$ (88, 144, 273)**

| $t$, °C | M ± 5% |
|---|---|
| S · 4Aq | |
| 10 | 4.74 |
| 20 | 5.18 |
| 60 | 6.98 |
| S · 4Aq + S · 2Aq | |
| 65U | 7.20 |
| S · 2Aq | |
| 70 | 7.32 |
| 110 | 8.26 |

**$FeCl_3$ (21)** *(See* Fig. 8)

| | |
|---|---|
| S · 6Aq | |
| −50 | 3.10 |
| −25 | 3.50 |
| 0 | 4.50 |
| +10 | 5.08 |
| 20 | 5.68 |

**$FeCl_3$.**—*(Continued)*

| $t$, °C | M ± 5% |
|---|---|
| S · 6Aq | |
| 30 | 6.60 |
| 35 | 7.54 |
| **37** | 9.25 |
| 35 | 11.00 |
| 30 | 12.88 |
| 20m | 14.30 |
| 10m | 14.88 |
| S · 3.5Aq | |
| 20m | 12.60 |
| 25m | 13.12 |
| 30 | 14.10 |
| **32.5** | 15.86 |
| 25m | 17.28 |
| S · 2.5Aq | |
| 20m | 15.52 |
| 40 | 17.90 |
| 50 | 19.48 |
| 55 | 21.10 |
| **56** | 22.20 |
| S · 2Aq | |
| 50m | 22.1 |
| 60 | 22.9 |
| 70 | 24.6 |
| **73.5** | 27.8 |
| 70 | 30.9 |
| 65m | 32.7 |
| S(?) | |
| 70 | 32.5 |
| 80 | 32.6 |
| 90 | 32.8 |
| 100 | 33.1 |
| S · 6Aq + S · 3.5Aq | |
| 27.4E | 13.48 |
| S · 6Aq + S · 2.5Aq | |
| 14mE | 14.66 |
| S · 3.5Aq + S · 2.5Aq | |
| 30E | 16.76 |
| S · 2.5Aq + S · 2Aq | |
| 55E | 22.50 |
| S · 2Aq + S(?) | |
| 66E | 32.2 |

**$FeBr_2$ (144)**

| $t$, °C | M |
|---|---|
| S · 6Aq | |
| −20 | 4.1 |
| −10 | 4.3 |
| +10 | 4.9 |
| 20 | 5.2 |
| 30 | 5.6 |
| 40 | 6.0 |
| S · 6Aq + S · 4Aq | |
| 48U(?) | 6.34(?) |
| S · 4Aq | |
| 50 | 6.4 |
| 70 | 6.9 |
| 100 | 8.2 |

**$FeSO_4$ (144, 169, 447, 452, 453, 496)** *(See* Fig. 9)

| $t$, °C | M ± 2% |
|---|---|
| S · 7Aq | |
| 0 | 1.030 |
| 10 | 1.35 |
| 20 | 1.74 |
| 30 | 2.16 |

**$FeSO_4$.—(*Continued*)**

| *t*, °C | M ± 2% |
|---|---|
| S · 7Aq | |
| 40 | 2.65 |
| 50 | 3.17 |
| S · 7Aq + S · 4Aq | |
| 56.6U | 3.60 |
| S · 7Aq + S · Aq | |
| 60.3mU | 3.85 |
| S · 4Aq | |
| 60 | 3.62 |
| 70m | 3.69 |
| S · 4Aq + S · Aq | |
| 64U | 3.66 |
| S · Aq | |
| 70 | 3.36 |
| 80 | 2.88 |
| 90 | 2.46 |

**$Fe(NO_3)_2$ (174)**

| *t*, °C | M ± 3% |
|---|---|
| S · 9Aq | |
| −30 | 3.03 |
| −20 | 3.18 |
| −15 | 3.30 |
| S · 9Aq + S · 6Aq | |
| ? | ? |
| S · 6Aq | |
| −10 | 3.63 |
| 0 | 3.93 |
| +10 | 4.28 |
| 20 | 4.67 |
| 30 | 5.09 |
| 40 | 5.60 |
| 50 | 6.38 |
| **60.5** | 9.25 |

**$NH_4Fe(SO_4)_2$ (299)**

| *t*, °C | M |
|---|---|
| S · 12Aq | |
| 25 | 1.67 |

**$FeSO_4.(NH_4)_2SO_4$ (299)**

| S · 6Aq | |
|---|---|
| 25 | 1.05 |

**$TlFe(SO_4)_2$ (298)**

| S · 12Aq | |
|---|---|
| 25 | 0.80 |

**$CoCl_2$ (88, 140, 144)**

| *t*, °C | M ± 3% |
|---|---|
| S · 6Aq | |
| −20 | 2.62 |
| −10 | 2.90 |
| 0 | 3.20 |
| +10 | 3.55 |
| 20 | 3.95 |
| 30 | 4.42 |
| 40 | 5.03 |
| 50 | 6.00 |
| S · 6Aq + S · 2Aq | |
| (56U) | (7.30) |
| S . 2Aq | |
| 60 | 7.30 |
| 70 | 7.39 |
| 80 | 7.52 |
| 90 | 7.70 |
| 100 | 7.96 |
| 110 | 8.35 |

**$Co(ClO_3)_2$ (323)**

| *t*, °C | M ± 2% |
|---|---|
| S · 6Aq | |
| −20 | 5.10 |
| −10 | 5.43 |
| 0 | 5.98 |
| +10 | 7.09 |
| S · 6Aq + S · 4Aq | |
| 14.8U | 7.85 |
| S · 4Aq | |
| 20 | 8.02 |
| 30 | 8.56 |
| 40 | 9.37 |
| 50 | 10.55 |
| 60 | 13.0 |
| **61** | 14.0 |

**$Co(ClO_4)_2$ (188)**

| *t*, °C | M |
|---|---|
| −30 | 3.1 |
| +20 | 4.1 |
| 30 | 4.3 |
| 40 | 4.5 |

**$CoBr_2$ (144)**

| 60 | 9.1 |
|---|---|
| 75 | 9.2 |
| 100 | 9.7 |

**$CoI_2$ (50, 144)**

| 0 | 7.6 |
|---|---|
| 40 | 10.2 |
| 80 | 12.9 |
| 120 | 14.2 |
| 160 | 15.6 |

Trans. pt. at 6.4°, data doubtful.

**$Co(IO_3)_2$ (322)** (*See* Fig. 10)

| *t*, °C | M ± 2% |
|---|---|
| S · 4Aq | |
| 0m | 0.0132 |
| 10m | 0.0170 |
| 20m | 0.0208 |
| 30m | 0.0253 |
| 40m | 0.0303 |
| 50m | 0.0363 |
| 60m | 0.0465 |
| 65m | 0.0541 |
| S · 4Aq + S | |
| 25m(?) | 0.023(?) |
| S · 2Aq | |
| 0 | 0.0078 |
| 10 | 0.0096 |
| 20 | 0.0113 |
| 30 | 0.0129 |
| 40 | 0.0148 |
| 50 | 0.0164 |
| 60 | 0.0182 |
| 70m | 0.0200 |
| 80m | 0.0218 |
| 90m | 0.0235 |
| 100m | 0.0252 |
| S · 2Aq + S | |
| 67U(?) | 0.019(?) |
| S | |
| 20m | 0.0246 |

**$Co(IO_3)_2$.—(*Continued*)**

| *t*, °C | M ± 2% |
|---|---|
| S | |
| 30m | 0.0220 |
| 50m | 0.0202 |
| 75 | 0.0186 |
| 100 | 0.0171 |

**$CoSO_4$ (266, 344, 496, 514)**

| S · 7Aq | |
|---|---|
| 0 | 1.64 |
| 10 | 1.95 |
| 20 | 2.33 |
| 30 | 2.72 |
| 40 | 3.14 |
| S · 7Aq + S · 6Aq | |
| 40.7U | 3.17 |
| S · 6Aq | |
| 50 | 3.49 |
| ↓ 100 | 5.25 |

**$Co(NO_3)_2$ (174)**

| S · 9Aq | |
|---|---|
| −25 | 3.60 |
| −23 | 3.75 |
| −21m | 4.00 |
| S · 9Aq + S · 6Aq | |
| −22U | 3.85 |
| S · 6Aq | |
| −20 | 3.92 |
| −10 | 4.24 |
| 0 | 4.61 |
| +10 | 5.03 |
| 20 | 5.52 |
| 30 | 6.08 |
| 40 | 6.84 |
| 50 | 7.90 |
| **56** | 9.26 |
| S · 6Aq + S · 3Aq | |
| 55U | 8.82 |
| S · 3Aq | |
| 60 | 9.2 |
| 70 | 10.1 |
| 80 | 11.3 |
| 90 | 14.3 |
| **91** | 18.5 |

**$CoSO_4.(NH_4)_2SO_4$ (299)**

| *t*, °C | M |
|---|---|
| S · 6Aq | |
| 25 | 0.52 |

**$CoC_{10}H_5NH_2(SO_3)_2$**
Naphthylaminedisulfonates
*v.* p. 219

**$NiCl_2$ (88, 144, 163)**

| *t*, °C | M ± 3% |
|---|---|
| S · 6Aq | |
| −20 | 3.3 |
| 0 | 3.9 |
| +20 | 4.6 |
| 40 | 5.3 |
| 60 | 6.1 |
| S · 6Aq + S · *x*Aq | |
| 72U | 6.7 |
| S · *x*Aq | |
| 80 | 6.7 |
| 100 | 6.8 |

**$Ni(ClO_3)_2$ (323)**

| *t*, °C | M ± 2% |
|---|---|
| S · 6Aq | |
| −20 | 4.30 |
| −10 | 4.60 |
| 0 | 4.93 |
| +10 | 5.37 |
| 20 | 5.94 |
| 30 | 6.9 |
| 40 | 8.5 |
| S · 6Aq + S · 4Aq | |
| 43U | 9.1 |
| S · 4Aq | |
| 50 | 9.4 |
| 60 | 9.8 |
| 70 | 10.5 |
| **79.5** | 13.7 |

**$Ni(ClO_4)_2$ (188)**

| *t*, °C | M |
|---|---|
| S · 9Aq(?) | |
| ↓ −30 | 3.5 |
| +20 | 4.3 |
| 30 | 4.4 |
| 40 | 4.6 |

**$NiBr_2$ (49, 144)**

| *t*, °C | M ± 10% |
|---|---|
| S · 6Aq(?) | |
| 0 | 5.1 |
| 20 | 6.1 |
| S · 6Aq + S · 3Aq(?) | |
| 28.5U | 6.6 |
| S · 3Aq(?) | |
| 40 | 6.6 |
| 60 | 6.8 |
| 80 | 7.0 |
| 100 | 7.4 |

**$NiI_2$ (144)**

| S · 6Aq(?) | |
|---|---|
| 0 | 4.0 |
| 20 | 4.7 |
| 40 | 5.6 |
| S · 6Aq(?) + S · *x*Aq | |
| 43U | 5.7 |
| S · *x*Aq | |
| 50 | 5.7 |
| 70 | 5.9 |
| 90 | 6.1 |

**$Ni(IO_3)_2$ (322)** (*See* Fig. 11)

| *t*, °C | M ± 5% |
|---|---|
| S · 4Aq | |
| 0m | 0.0181 |
| 10m | 0.0215 |
| 20m | 0.0264 |
| 30m | 0.0350 |
| S · 2Aq(α) | |
| 0m | 0.0130 |
| 10m | 0.0147 |
| 20m | 0.0173 |
| 30m | 0.0213 |
| 40m | 0.0296 |
| 50m | 0.0443 |
| S · 2Aq(α) + S | |
| 38mU | 0.027 |

**$Ni(IO_3)_2$.—(*Continued*)**

| *t*, °C | M ± 5% |
|---|---|
| S · 2Aq(*β*) | |
| 0 | 0.0128 |
| 20 | 0.0144 |
| 40 | 0.0170 |
| 60 | 0.0213 |
| 80m | 0.0277 |
| S · 2Aq(*β*) + S | |
| 74U | 0.025 |
| S | |
| 30m | 0.0281 |
| 50m | 0.0265 |
| 70m | 0.0255 |
| 90 | 0.0245 |

**$NiSO_4$ (476)**

| *t*, °C | M ± 3% |
|---|---|
| S · 7Aq | |
| − 5 | 1.66 |
| +10 | 2.06 |
| 20 | 2.37 |
| 30 | 2.76 |
| 35m | 2.99 |
| S · 7Aq + S · 6Aq(*α*) | |
| 31.5U | 2.82 |
| S · 6Aq(*α*) | |
| 35 | 2.84 |
| 40 | 2.93 |
| 50 | 3.24 |
| S · 6Aq(*α*) + S · 6Aq(*β*) | |
| 53.6U | 3.39 |
| S · 6Aq(*β*) | |
| 55 | 3.41 |
| ↓ 60 | 3.65 |
| ↓ 100 | 4.79 |

*α* is blue; *β* is green.

**$Ni(NO_3)_2$ (174)**

| | |
|---|---|
| S · 9Aq | |
| −25 | 3.36 |
| −20 | 3.66 |
| −15m | 3.99 |
| −10m | 4.38 |
| S · 9Aq + S · 6Aq | |
| −16.2U | 3.80 |
| S · 6Aq | |
| −20m | 3.69 |
| −10 | 4.00 |
| 0 | 4.35 |
| +20 | 5.27 |
| 40 | 6.67 |
| 50 | 7.72 |
| **56.7m** | 9.25 |
| S · 6Aq + S · 3Aq | |
| 54.5U | 8.50 |
| S · 3Aq | |
| 60 | 8.90 |
| 70 | 9.76 |
| 80 | 10.8 |
| 90 | 12.9 |
| **95** | 18.6 |

**$NiSO_4.(NH_4)_2SO_4$ (299)**

| *t*, °C | M |
|---|---|
| S · 6Aq | |
| 25 | 0.265 |

**$NiC_{10}H_5NH_2(SO_3)_2$**
Naphthylaminedisulfonates
*v.* p. 219

**$NiSO_4.Tl_2SO_4$ (299)**

| *t*, °C | M |
|---|---|
| S · 6Aq | |
| 25 | 0.070 |

**$CrO_3$ (72, 182, 264, 269, 358, 449)**

| *t*, °C | M ± 2% |
|---|---|
| S | |
| 0 | 16.2 |
| 20 | 16.8 |
| 40 | 17.5 |
| 60 | 18.3 |
| 80 | 19.3 |
| 100 | 20.5 |
| 120 | 23.0 |

**$(NH_4)_2CrO_4$ (449)**

| *t*, °C | M |
|---|---|
| S | |
| 30 | 2.66 |

**$(NH_4)_2Cr_2O_7$ (336, 449)**

| *t*, °C | M ± 2% |
|---|---|
| S | |
| 15 | 1.22 |
| 20 | 1.38 |
| 25 | 1.59 |
| 30 | 1.87 |

**$NH_4Cr(SO_4)_2$ (263, 298)**

| | |
|---|---|
| S · 12Aq | |
| 0 | 0.150 |
| 10 | 0.240 |
| 20 | 0.342 |
| 30 | 0.470 |
| 40 | 0.662 |

**$TlCr(SO_4)_2$ (298)**

| *t*, °C | M |
|---|---|
| S · 12Aq | |
| 25 | 0.212 |

**$Ag_2CrO_4$ (523)**

| *t*, °C | M ± 20% |
|---|---|
| ↓ 20 | $8.3 \times 10^{-5}$ |
| ↓ 50 | $16.5 \times 10^{-5}$ |

**$UO_2Cl_2$ (355)**

| *t*, °C | M |
|---|---|
| 18 | 21.9 |

**$(UO_2)SO_4$ (372)**

| | |
|---|---|
| S · 3Aq | |
| 13 | 0.461 |
| 16 | 0.513 |

**$U(SO_4)_2$ (183)**

| | |
|---|---|
| S · 8Aq | |
| 93 | 3.99 |
| 90 | 3.50 |
| 80 | 2.38 |
| 70 | 1.74 |
| 60 | 1.30 |
| 50 | 0.96 |
| 40 | 0.65 |
| 30 | 0.430 |
| 20 | 0.283 |
| S · 8Aq + S · 4Aq | |
| 18U | 0.270 |

**$U(SO_4)_2$.—(*Continued*)**

| *t*, °C | M |
|---|---|
| S · 4Aq | |
| ↓ 20 | 0.263 |
| ↓ 60 | 0.162 |

**$UO_2(NO_3)_2$ (509)**

| | |
|---|---|
| S · 6Aq | |
| −20 | 1.96 |
| −10 | 2.21 |
| 0 | 2.48 |
| +10 | 2.79 |
| 20 | 3.17 |
| 30 | 3.63 |
| 40 | 4.28 |
| 50 | 5.19 |
| S · 6Aq + S · 3Aq | |
| 60.2U | 6.4 |

**$UO_2C_2O_4$ (103, 126)**
Oxalate

| | |
|---|---|
| S · 3Aq(?) | |
| 15 | 0.0132 |
| 25 | 0.0180 |
| 50 | 0.0282 |

**$UO_2(HCO_2)_2$ (108)**
Formate

| | |
|---|---|
| S · Aq | |
| 15 | 0.200* |

* Per 1 soln.

**$UO_2(CH_3CO_2)_2$ (108)**
Acetate

| | |
|---|---|
| S · 2Aq | |
| 17 | 0.200 |

**$UO_2(C_2H_5CO_2)_2$ (108)**
Propionate

| | |
|---|---|
| S · 2Aq | |
| 19 | 0.204 |

**$UO_2(C_3H_7CO_2)_2$ (108)**
Butyrate

| | |
|---|---|
| S · 2Aq | |
| 17 | 0.237 |

**$UO_2(C_3H_7CO_2)_2$ (108)**
Isobutyrate

| | |
|---|---|
| S · 2Aq | |
| 20 | 0.096 |

**$UO_2(C_4H_9CO_2)_2$ (108)**
Isovalerate

| | |
|---|---|
| S · 2Aq | |
| 14 | 0.078 |

**$NH_4V(SO_4)_2$ (299)**

| | |
|---|---|
| S · 12Aq | |
| 25 | 1.22 |

**$TlV(SO_4)_2$ (298)**

| | |
|---|---|
| S · 12Aq | |
| 25 | 0.58 |

**$H_3BO_3$ (10, 220, 224, 361)**
*v. also* p. 251

| | |
|---|---|
| S | |
| 0 | 0.429 |
| 10 | 0.582 |
| 20 | 0.800 |
| 30 | 1.076 |
| 40 | 1.420 |
| 50 | 1.862 |

**$H_3BO_3$.—(*Continued*)**

| *t*, °C | M |
|---|---|
| S | |
| 60 | 2.390 |
| 70 | 3.00 |
| 80 | 3.81 |
| 90 | 4.90 |
| 100 | 6.38 |

**$(NH_4)_2B_4O_7$ (441)**

| | |
|---|---|
| 0 | 0.203 |
| 10 | 0.289 |
| 20 | 0.424 |
| 25 | 0.516 |

**$Al_2(SO_4)_3$ (57, 271, 398)**

| *t*, °C | M ± 3% |
|---|---|
| S · 18Aq | |
| 0 | 0.92 |
| 10 | 0.98 |
| 20 | 1.06 |
| 30 | 1.18 |
| 40 | 1.34 |
| 50 | 1.52 |
| ↓ 60 | 1.73 |
| ↓ 100 | 2.60 |

**$Al(NO_3)_3$ (243)**

| *t*, °C | M |
|---|---|
| S · 18Aq | |
| 25 | 3.01 |

**$NH_4Al(SO_4)_2$ (298, 398)**

| *t*, °C | M ± 4% |
|---|---|
| S · 12Aq | |
| 0 | 0.088 |
| 10 | 0.202 |
| 20 | 0.324 |
| 30 | 0.460 |
| 40 | 0.628 |
| 50 | 0.848 |
| 60 | 1.13 |
| 70 | 1.48 |
| 80 | 1.93 |
| 90 | 2.48 |
| 100 | 3.14 |

**$N_2H_4.AlH(SO_4)_2$ (472)**
Hydrazine aluminium sulfate

| *t*, °C | M |
|---|---|
| S . 12Aq | |
| 25 | 1.27 |

**$TlAl(SO_4)_2$ (36, 298)**

| | |
|---|---|
| S · 12Aq | |
| 0 | 0.075 |
| 10 | 0.104 |
| 20 | 0.154 |
| 30 | 0.223 |
| 40 | 0.340 |
| 50 | 0.540 |
| 60 | 0.840 |

**$Sc_2(SO_4)_3$ (528)**

| | |
|---|---|
| S · 5Aq | |
| 25 | 1.05 |

**$YCl_3$ (110, 524*)**

| | |
|---|---|
| 0 | 3.80 |
| ↓ 20 | 3.85 |
| ↓ 80 | 4.00 |

* In (524) are given values *ca.* 2.5 % higher.

**$YBr_3$ (110)**

| $t$, °C | M |
|---|---|
| 0 | 1.96 |
| 20 | 2.32 |
| 40 | 2.70 |
| 60 | 3.10 |
| 80 | 3.53 |
| 100 | 4.02 |

**$Y_2(SO_4)_3$ (110)**

| | |
|---|---|
| 0 | 0.179 |
| 20 | 0.154 |
| ↓ 40 | 0.127 |
| ↓ 100 | 0.035 |

**$Y(NO_3)_3$ (110)**

| | |
|---|---|
| 0 | 3.39 |
| 10 | 4.03 |
| 20 | 4.68 |
| ↓ 30 | 5.32 |
| ↓ 70 | 7.90 |

**$La(IO_3)_3$ (209, 423)**

S

| | |
|---|---|
| 25 (209) | 0.001031 |
| 25 (423) | 0.00254 |

**$La_2(SO_4)_3$ (353, 526)**

| $t$, °C | M ± 10% |
|---|---|
| S · 9Aq | |
| 0 | 0.0534 |
| 10 | 0.0469 |
| 20 | 0.0405 |
| 30 | 0.0348 |
| 40 | 0.0297 |
| 50 | 0.0253 |
| 60 | 0.0220 |
| 70 | 0.0191 |
| 80 | 0.0167 |
| 90 | 0.0143 |
| 100 | 0.0122 |

**$La(NO_3)_3$ (250)**

| $t$, °C | M |
|---|---|
| 25 | 4.65 |

**$La(CH_3CO_2)_3$ (510)**

Acetate

| | |
|---|---|
| 18 | 0.65 |

**$Ce(IO_3)_3$ (423)**

S

| | |
|---|---|
| 25 | 0.0022 |

**$Ce_2(SO_4)_3$ (262, 526)** (*See* Fig. 12)

| $t$, °C | M ± 2% |
|---|---|
| S · 12Aq | |
| 0 | 0.291 |
| 10m | 0.300 |
| 20m | 0.310 |
| S · 9Aq | |
| 0m | 0.369 |
| 10m | 0.253 |
| 20m | 0.176 |
| 30 | 0.129 |
| 40 | 0.101 |
| 50m | 0.0822 |
| 60m | 0.0682 |
| S · 8Aq | |
| 0m | 0.336 |
| 10 | 0.232 |

**$Ce_2(SO_4)_3$.**—(*Continued*)

| $t$, °C | M ± 2% |
|---|---|
| S · 8Aq | |
| 20 | 0.169 |
| 30m | 0.130 |
| 40m | 0.105 |
| 50m | 0.0841 |
| 60m | 0.0712 |
| S · 5Aq | |
| 45m | 0.155 |
| 55m | 0.0765 |
| 70m | 0.0339 |
| 80m | 0.0216 |
| 90m | 0.0142 |
| 100m | 0.0088 |
| S · 4Aq | |
| 35m | 0.149 |
| 40m | 0.108 |
| 50 | 0.0605 |
| 60 | 0.0379 |
| 70 | 0.0260 |
| 80 | 0.0187 |
| 90 | 0.0129 |
| 100 | 0.0079 |
| S · 12Aq + S · 9Aq | |
| 6.0mU | 0.296 |
| S · 12Aq + S · 8Aq | |
| 3.7U | 0.294 |
| S · 9Aq + S · 8Aq | |
| 27.5U | 0.138 |
| S · 9Aq + S · 5Aq | |
| 55.7mU | 0.0739 |
| S · 9Aq + S · 4Aq | |
| 41.8U | 0.0975 |
| S · 8Aq + S · 5Aq | |
| 54.9mU | 0.0772 |
| S · 8Aq + S · 4Aq | |
| 40.9mU | 0.1025 |

**$Ce_2(SeO_4)_3$* (86)**

| $t$, °C | M |
|---|---|
| 0 | 0.56 |
| 20 | 0.50 |
| 40 | 0.46 |
| 60 | 0.19 |
| 80 | 0.07 |
| 100 | 0.03 |

* Hydration and stability of solid phase uncertain.

**$(NH_4)_2Ce(NO_3)_5$ (530)**

| | |
|---|---|
| S · 4Aq | |
| 10 | 5.0 |
| 20 | 5.7 |
| 30 | 6.6 |
| 40 | 7.7 |
| 50 | 9.6 |
| S · 4Aq + S · $x$Aq | |
| 56U(?) | 11.7(?) |
| S · $x$Aq | |
| 60 | 14.0 |
| 65 | 16.8 |

**$(NH_4)_2Ce(NO_3)_6$ (530)**

S

| | |
|---|---|
| 25 | 2.60 |
| 30 | 2.76 |
| 40 | 3.04 |
| 50 | 3.31 |

**$(NH_4)_2Ce(NO_3)_6$.**—(*Cont'd*)

| $t$, °C | M |
|---|---|
| S | |
| 60 | 3.56 |
| 70 | 3.79 |
| 80 | 4.01 |
| 90 | 4.23 |

**$NH_4Ce(SO_4)_2$ (530)**

| | |
|---|---|
| S · 4Aq | |
| 20m? | 0.154 |
| 30m? | 0.149 |
| 40m | 0.145 |
| 50m | 0.140 |
| S · 4Aq + S | |
| 20(?)U | 0.15(?) |
| S | |
| 40 | 0.093 |
| 50 | 0.075 |
| 60 | 0.060 |
| 70 | 0.046 |
| 80 | 0.036 |
| 90 | 0.030 |

**$Ce(HCO_2)_3$ (530)**

Formate

| | |
|---|---|
| 15 | 0.0145 |
| 75 | 0.0136 |

**$Ce(CH_3CO_2)_3$ (530)**

Acetate

| | |
|---|---|
| 15 | 0.77 |
| 75 | 0.47 |

**$Ce(C_2H_5CO_2)_3$ (530)**

Propionate

| | |
|---|---|
| 15 | 0.65 |
| 75 | 0.53 |

**$Ce(C_3H_7CO_2)_3$ (530)**

Butyrate

| | |
|---|---|
| 15 | 0.088 |
| 75 | 0.050 |

**$Ce(C_3H_7CO_2)_3$ (530)**

Isobutyrate

| | |
|---|---|
| 20 | 0.176 |
| 75 | 0.087 |

**$PrCl_3$ (314)**

| | |
|---|---|
| 15 | 4.2 |

**$Pr_2(SO_4)_3$ (353, 442)**

| | |
|---|---|
| S · 8Aq | |
| 0m? | 0.35 |
| 10m? | 0.29 |
| 20m? | 0.24 |
| 30m? | 0.20 |
| 40m? | 0.15 |
| 50m? | 0.14 |
| 60m? | 0.11 |
| 70m? | 0.085 |
| 80m? | 0.061 |
| S · 5Aq | |
| 85 | 0.028 |
| 90 | 0.023 |
| 95 | 0.019 |
| S | |
| 0m | 0.415(?) |
| 20m | 0.311(?) |

**$Pr(NO_3)_3.3Zn(NO_3)_2.24Aq$ (402.5)**

**$Pr(NO_3)_3.3Co(NO_3)_2.24Aq$ (402.5)**

**$Pr(NO_3)_3.3Ni(NO_3)_2.24Aq$ (402.5)**

**$NdCl_3$ (313, 314, 524)**

| $t$, °C | M |
|---|---|
| 10 | 3.86 |
| 20 | 3.91 |
| 30 | 3.97 |
| 40 | 4.05 |
| 50 | 4.27 |
| 100 | 5.6 |

**$Nd_2(SO_4)_3$ (353, 526)**

| $t$, °C | M |
|---|---|
| S · 8Aq | |
| 0 | 0.166 |
| 10 | 0.136 |
| 20 | 0.111 |
| 30 | 0.090 |
| 40 | 0.075 |
| 60 | 0.057 |
| 80 | 0.047 |
| 100 | 0.039 |

**$Nd(NO_3)_3.3Zn(NO_3)_2.24Aq$ (402.5)**

**$Nd(NO_3)_3.3Co(NO_3)_2.24Aq$ (402.5)**

**$Nd(NO_3)_3.3Ni(NO_3)_2.24Aq$ (402.5)**

**$SaCl_3$ (524)**

| $t$, °C | M |
|---|---|
| 10 | 3.59 |
| 20 | 3.64 |
| 30 | 3.68 |
| 40 | 3.77 |
| 50 | 3.90 |

**$Sa_2(SO_4)_3$ (528)**

| | |
|---|---|
| S · 8Aq | |
| 25 | 0.060 |

**$Gd_2(SO_4)_3$ (33, 41, 526)**

| | |
|---|---|
| S · 8Aq | |
| 0 | 0.068 |
| 10 | 0.053 |
| 20 | 0.044 |
| 30 | 0.038 |
| 40 | 0.034 |

**$Er_2(SO_4)_3$ (528)**

| | |
|---|---|
| S · 8Aq | |
| 25 | 0.22 |

**$Yb_2(SO_4)_3$ (89)**

| | |
|---|---|
| S · 8Aq | |
| 0 | 0.71 |
| 10 | 0.58 |
| 20 | 0.46 |
| 30 | 0.36 |
| 40 | 0.27 |
| 50 | 0.21 |
| 60 | 0.16 |
| 70 | 0.13 |
| 80 | 0.11 |
| 90 | 0.09 |
| 100 | 0.07 |

### Rare Earth Bromates (249.5)

Solid Phase $R(BrO_3)_3 \cdot 9Aq$

Wt. % of $R(BrO_3)_3 \cdot 9Aq$ in solution

| °C \ R | La | Pr | Nd | Sa | Gd | Tb |
|---|---|---|---|---|---|---|
| 0 | 64.8 | 47.0 | 39.9 | 33.2 | 33.4 | 39.9 |
| 5 | 68.2 | 51.4 | 44.5 | 37.6 | 37.5 | 43.6 |
| 10 | 71.5 | 55.3 | 48.6 | 42.0 | 41.2 | 47.3 |
| 15 | 74.9 | 59.0 | 52.7 | 46.2 | 45.3 | 50.6 |
| 20 | 78.4 | 62.7 | 56.3 | 50.2 | 48.9 | 53.9 |
| 25 | 82.2 | 66.2 | 60.2 | 54.0 | 52.5 | 57.1 |
| 30 | 87.3 | 69.8 | 63.8 | 57.5 | 55.8 | 60.3 |
| 35 | 91.4 | 73.6 | 67.3 | 61.1 | 59.1 | 63.4 |
| 40 | | 77.2 | 70.2 | 64.7 | 62.4 | 66.5 |
| 45 | | 81.3 | 74.4 | 68.2 | 66.2 | 69.4 |

### Bromonitrobenzenesulfonates of Rare Earths (255)

$A = (C_6H_3BrNO_2SO_3)$

$t = 25°C$

| | M |
|---|---|
| $TaA_3 \cdot 12Aq$ | 0.0674 |
| $YA_3 \cdot 10Aq$ | 0.0653 |
| $LaA_3 \cdot 8Aq$ | 0.0509 |
| $CeA_3 \cdot 8Aq$ | 0.0598 |
| $PrA_3 \cdot 8Aq$ | 0.0618 |
| $NdA_3 \cdot 8Aq$ | 0.0735 |
| $SaA_3 \cdot 10Aq$ | 0.0790 |
| $EuA_3 \cdot 10Aq$ | 0.0677 |
| $GdA_3 \cdot 10Aq$ | 0.0630 |
| $ErA_3 \cdot 12Aq$ | 0.0639 |
| $YbA_3 \cdot 12Aq$ | 0.0774 |

### Dimethylphosphates of Rare Earths (340)

$A = (CH_3)_2PO_4$

$t = 25°C$

| | M |
|---|---|
| $YA_3$ | 0.0603 |
| $LaA_3$ | 2.02 |
| $CeA_3$ | 1.544 |
| $PrA_3$ | 1.242 |
| $NdA_3$ | 1.080 |
| $SaA_3$ | 0.670 |
| $GdA_3$ | 0.449 |
| $ErA_3$ | 0.0330 |
| $YbA_3$ | 0.0219 |

### $(NH_4)_2HfF_6$ (227)

| $t$, °C | M* |
|---|---|
| 0 | 0.897 |
| 20 | 1.420 |

Hf = 178.6.

* Per 1 soln.

### $(NH_4)_3HfF_7$ (227)

| | |
|---|---|
| 0 | 0.418 |
| 20 | 0.587 |

### $BeSO_4$ (56, 59, 268, 291, 527)

| $t$, °C | M |
|---|---|
| $S \cdot 4Aq(?)$ | |
| 25 | 4.00 |
| 30 | 4.15 |
| 40 | 4.50 |
| 50 | 5.00 |
| 60 | 5.50 |
| 70 | 6.10 |
| 80 | 6.8 |

### $BeSO_4$.—(*Continued*)

| | |
|---|---|
| $S \cdot 4Aq(?)$ | |
| $t$, °C | M |
| 90 | 7.8 |
| 100 | 9.4 |
| 110 | 11.8 |
| $S \cdot 4Aq + S \cdot 2Aq$ | |
| 113(?) | 13.0(?) |
| $S \cdot 2Aq(?)$ | |
| 80(m?) | 8.0 |
| 90(m?) | 9.2 |
| 100(m?) | 10.5 |
| 110(m?) | 12.3 |
| $S \cdot 6Aq(?)$ | |
| 25 | 4.8* |
| 25 | 0.78† |

Little agreement as to compn. of phases or solubilities.

* (291). † (527).

### $MgCl_2$ (40, 44, 139, 236, 426, 482) (*See* Fig. 13)

| $t$, °C | M ± 2%* |
|---|---|
| $S \cdot 12Aq$ | |
| −35 | 2.68 |
| −30 | 2.99 |
| −25 | 3.32 |
| −20 | 3.80 |
| **−16.4** | 4.63 |
| $S \cdot 12Aq + S \cdot 8Aq(\alpha)$ | |
| −16.8E | 4.86 |
| $S \cdot 12Aq + S \cdot 8Aq(\beta)$ | |
| −17.4mE | 5.00 |
| $S \cdot 12Aq + S \cdot 6Aq$ | |
| −19.4mE | 5.24 |
| $S \cdot 6Aq + S \cdot 8Aq(\beta)$ | |
| − 9.6mU | 5.39 |
| $S \cdot 6Aq + S \cdot 8Aq(\alpha)$ | |
| − 3.4U | 5.49 |
| $S \cdot 6Aq$ | |
| 0 | 5.50 |
| 20 | 5.76 |
| ↓ 60 | 6.39 |
| 80 | 6.82 |
| 100 | 7.59 |
| $S \cdot 6Aq + S \cdot 4Aq$ | |
| 116.7U | 8.98 |
| $S \cdot 4Aq$ | |
| 120 | 9.07 |
| 140 | 9.60 |

### $MgCl_2$.—(*Continued*)

| $t$, °C | M ± 2%* |
|---|---|
| $S \cdot 4Aq$ | |
| 160 | 10.39 |
| 180 | 12.69 |
| $S \cdot 4Aq + S \cdot 2Aq$ | |
| 181.5U | 13.21 |
| $S \cdot 2Aq$ | |
| 186 | 13.34 |

* Below 100°.

### $Mg(ClO_3)_2$ (80, 323, 357)

| $t$, °C | M ± 3% |
|---|---|
| $S \cdot 6Aq$ | |
| −20 | 5.54 |
| −10 | 5.71 |
| 0 | 5.96 |
| +10 | 6.30 |
| 20 | 6.87 |
| 30 | 8.03 |
| 35m | 9.15 |
| **35.1m** | 9.25 |
| $S \cdot 6Aq + S \cdot 4Aq$ | |
| 32U(?) | 8.4(?) |
| $S \cdot 6Aq + S \cdot 2Aq$ | |
| 35mE | 9.45 |
| $S \cdot 4Aq$ | |
| 42 | 9.21 |
| 65.5 | 11.70 |
| $S \cdot 2Aq$ | |
| 40m | 9.90 |
| 50m | 10.81 |
| 60m | 11.78 |
| 70m | 12.80 |

### $MgBr_2$ (320, 357)

| $t$, °C | M |
|---|---|
| $S \cdot 6Aq$ | |
| 0 | 4.99 |
| 20 | 5.25 |
| 40 | 5.55 |
| 60 | 5.84 |
| 80 | 6.16 |
| 100 | 6.53 |
| 120 | 6.94 |
| 140 | 7.52 |
| 150 | 8.00 |
| 160 | 8.70 |
| **164** | 9.25 |

### $MgI_2$ (320, 357)

| | |
|---|---|
| $S \cdot 8Aq$ | |
| 0 | 4.35 |
| 20 | 5.03 |
| 30 | 5.48 |
| 40 | 6.20 |
| **43.5m** | 6.94 |
| $S \cdot 8Aq + S \cdot 6Aq$ | |
| 43.0 | 6.54 |
| $S \cdot 6Aq$ | |
| ↓ 60 | 6.62 |
| ↓ 140 | 6.90 |
| 160 | 7.01 |
| 180 | 7.17 |
| 200 | 7.37 |
| 220 | 7.70 |

### $Mg(IO_3)_2$ (357, 358)

| $t$, °C | M ± 4% |
|---|---|
| $S \cdot 10Aq$ | |
| 0 | 0.084 |
| 10 | 0.152 |
| 20m | 0.306 |
| 30m | 0.566 |
| 35m | 0.752 |
| $S \cdot 10Aq + S \cdot 4Aq$ | |
| 13.9U | 0.200 |
| $S \cdot 4Aq$ | |
| 0m | 0.158 |
| 20 | 0.222 |
| 40 | 0.254 |
| 60 | 0.380 |
| 80 | 0.480 |
| 100 | 0.606 |

### $MgSO_4$ (26, 44, 70, 144, 180, 199, 202, 217, 237, 247, 301, 447, 482, 496, 522)

| $t$, °C | M |
|---|---|
| $S \cdot 12Aq$ | |
| − 3.9 | 1.95 |
| $S \cdot 12Aq + S \cdot 7Aq$ | |
| + 1.8U | 2.22 |
| $S \cdot 7Aq$ | |
| 10 | 2.53 |
| 20 | 2.88 |
| 30 | 3.30 |
| 40 | 3.70 |
| $S \cdot 7Aq + S \cdot 6Aq$ | |
| 48.2U | 4.10 |
| $S \cdot 6Aq$ | |
| 50 | 4.15 |
| 60 | 4.55 |
| $S \cdot 6Aq + S \cdot Aq$ | |
| 68U | 4.88 |
| $S \cdot Aq$ | |
| 80 | 5.3 |
| 100 | 5.9 |
| 120 | 6.6 |

### $MgS_2O_6$ (11)

| | |
|---|---|
| $S \cdot 6Aq$ | |
| 0 | 2.54 ± 2% |
| 10 | 2.67 ± 2% |
| 20 | 2.80 ± 2% |
| 30 | 2.93 ± 2% |

### $Mg(NO_3)_2$ (174, 247, 357)

| $t$, °C | M ± 2% |
|---|---|
| $S \cdot 9Aq$ | |
| −25 | 3.64 |
| −20 | 3.88 |
| $S \cdot 9Aq + S \cdot 6Aq$ | |
| −18U | 4.14 |
| $S \cdot 6Aq$ | |
| −10 | 4.28 |
| 0 | 4.48 |
| +20 | 5.00 |
| 40 | 5.66 |
| 60 | 6.52 |
| 80 | 7.72 |
| **90** | 9.25 |
| 85 | 12.2 |
| 80 | 13.0 |
| 70 | 13.8 |

**$MgSO_4.(NH_4)_2SO_4$ (299, 303, 402)**

| $t$, °C | M |
|---|---|
| S · 6Aq | |
| 0 | 0.468 |
| 10 | 0.580 |
| 20 | 0.710 |
| 30 | 0.859 |
| 40 | 1.023 |
| 60 | 1.391 |
| 80 | 1.911 |
| 100 | 2.60 |

**$MgCO_3$** (*v.* Vol. III, p. 377)

**$MgC_4H_4O_4$ (484)**
Succinate

| | |
|---|---|
| 15 | 2.29 |
| 100 | 14.1 |

**$MgC_4H_4O_5$ (132)**
*l*-Malate

| | |
|---|---|
| S · 3Aq | |
| 0 | 0.132 |
| 10 | 0.146 |
| 20 | 0.159 |
| 30 | 0.173 |
| 40 | 0.186 |

**$MgC_4H_4O_5$ (132)**
*dl*-Malate

| | |
|---|---|
| S · 2.5Aq | |
| 0 | 0.060 |
| 10 | 0.068 |
| 20 | 0.076 |
| 30 | 0.084 |
| 40 | 0.092 |

**$MgC_4H_4O_6$ (132)**
Tartrate

| | |
|---|---|
| S · 4Aq | |
| 0 | 0.0313 |
| 10 | 0.0457 |
| 20 | 0.0610 |
| 30m | 0.0782 |
| 37.5m | 0.0963 |
| S · 4Aq + S · 2Aq | |
| 26U | 0.071 |
| S · 2Aq | |
| 10m | 0.078 |
| 20m | 0.074 |
| 30 | 0.068 |
| 40 | 0.059 |

**$MgC_4H_4O_6$ (132)**
Racemate

| | |
|---|---|
| S · 5Aq | |
| 0 | 0.0235 |
| 10 | 0.0317 |
| 20 | 0.0420 |
| 30 | 0.0541 |
| 40 | 0.0680 |

**$Mg(C_6H_5CO_2)_2$ (484)**
Benzoate

| | |
|---|---|
| 15 | 0.23 |
| 100 | 0.74 |

**$Mg(C_6H_5CH{:}CHCO_2)_2$ (484)**
Cinnamate

| | |
|---|---|
| 15 | 0.027 |
| 100 | 0.062 |

**$MgC_{10}H_5NH_2(SO_3)_2$**
Naphthylaminedisulfonates
*v.* p. 219

**$Mg_2GeO_4$ (350)**

| $t$, °C | M |
|---|---|
| 26 | 0.000087 |

**$MgCl_2.2CdCl_2$ (421)**

| $t$, °C | M ± 3% |
|---|---|
| S · 12Aq | |
| 0 | 1.80 |
| ↓ 20 | 2.11 |
| ↓ 80 | 3.16 |
| 100 | 3.57 |
| 120 | 4.04 |

**$MgCrO_4$ (357)**

| $t$, °C | M |
|---|---|
| S · 7Aq | |
| 18 | 5.2 |

**$Mg(NO_3)_2.Pr(NO_3)_3.24Aq$ (402.5)**

**$Mg(NO_3)_2.Nd(NO_3)_3.24Aq$ (402.5)**

**$Ca(OH)_2$ (27, 29, 77, 84, 215, 219, 226, 306, 419)**

| $t$, °C | M ± 3% |
|---|---|
| S | |
| 0 | 0.0239 |
| 10 | 0.0230 |
| 20 | 0.0218 |
| ↓ 30 | 0.0202 |
| ↓ 100 | 0.0090 |
| 125 | 0.0052 |
| 150 | 0.0030 |
| 175 | 0.0018 |
| 200 | 0.0013 |

**$CaCl_2$(17, 22, 139, 279, 426)**
(*See* Fig. 14)

| $t$, °C | M ± 2%* |
|---|---|
| S · 6Aq | |
| − 50 | 3.92 |
| − 40 | 4.13 |
| − 30 | 4.36 |
| − 20 | 4.64 |
| − 10 | 4.96 |
| 0 | 5.35 |
| + 10 | 5.85 |
| 20 | 6.70 |
| 25 | 7.38 |
| **30.2m** | 9.25 |
| S · 6Aq + S · 4Aq(α) | |
| 30.0U | 9.14 |
| S · 6Aq + S · 4Aq(β) | |
| 29.2mE | 10.25 |
| S · 4Aq(α) | |
| 20m | 8.17 |
| 35 | 9.74 |
| 40 | 10.41 |
| S · 4Aq(α) + S · 2Aq | |
| 45.5U | 11.73 |
| S · 4Aq(β) | |
| 20m | 9.41 |
| 30m | 10.35 |
| 35m | 10.92 |

**$CaCl_2$.**—(*Continued*)

| $t$, °C | M ± 2%* |
|---|---|
| S · 4Aq(β) + S · 2Aq | |
| 38.4mU | 11.50 |
| S · 2Aq | |
| 40m | 11.5 |
| 60 | 12.3 |
| 80 | 13.2 |
| 100 | 14.2 |
| 120 | 15.4 |
| 140 | 17.2 |
| 160 | 20.0 |
| S · 2Aq + S · Aq | |
| 175.5U | 26.8 |
| S · Aq | |
| 200 | 28.0 |
| 220 | 29.0 |
| 240 | 29.9 |
| S · Aq + S | |
| 260U | 30.5 |
| $t$, °C† (296) | M |
| S · 6Aq | |
| 29.31 | 10.02 |
| 29.49 | 9.875 |
| 29.64 | 9.754 |
| 29.71 | 9.661 |
| 29.76 | 9.610 |
| 29.80 | 9.552 |
| 29.83 | 9.501 |
| 29.87 | 9.439 |
| 29.89 | 9.375 |
| 29.91 | 9.320 |
| 29.92 | 9.265 |
| 29.92 | 9.219 |
| 29.93 | 9.151 |
| 29.90 | 9.091 |
| 29.85 | 9.010 |
| 29.80 | 8.923 |
| 29.73 | 8.838 |
| 29.65 | 8.726 |
| 29.53 | 8.618 |

* ±2 % below 100°.

† There may be an absolute error of 0.15°. The relative error seems to be 0.01°.

**$Ca(ClO_3)_2$ (357)**

| $t$, °C | M |
|---|---|
| S · 2Aq | |
| 18 | 8.6 |

**$CaBr_2$ (279, 304)**

| $t$, °C | M ± 5% |
|---|---|
| S · 6Aq | |
| **0** | 6.2 |
| 20 | 7.1 |
| **34.2** | 9.3 |
| S · $x$Aq | |
| 40 | 10.6 |
| 60 | 13.9 |
| 105 | 15.6 |

**$CaI_2$ (144, 279)**

| | |
|---|---|
| S · 6Aq | |
| − 20 | 5.60 |
| 9 | 6.20 |

**$CaI_2$.**—(*Continued*)

| $t$, °C | M ± 5% |
|---|---|
| S · 6Aq | |
| +20* | 7.00 |
| 40 | 8.30 |
| 60 | 10.2 |
| S · $x$Aq | |
| 80 | 12.8 |
| 100 | 16.0 |

* There is a transition pt. *ca.* 40°. Detns. at higher $t$ are very inaccurate.

**$Ca(IO_3)_2$ (357, 358)**

| $t$, °C | M ± 3% |
|---|---|
| S · 6Aq | |
| 0 | 0.0025 |
| 10 | 0.0040 |
| 20 | 0.0057 |
| 30 | 0.0105 |
| 40m | 0.0156 |
| 50m | 0.0228 |
| 60m | 0.0326 |
| S · 6Aq + S · Aq | |
| 30.5U | 0.0106 |
| S · Aq | |
| 20m | 0.0088 |
| 40 | 0.0124 |
| 60 | 0.0160 |
| 80 | 0.0196 |
| 100 | 0.0231 |

**CaS (420)**

| $t$, °C | M |
|---|---|
| 20 | 0.00295 |

**$CaSO_4$ (52, 145, 203, 208, 234, 240, 241, 319, 405, 495)**

| $t$, °C* | M† |
|---|---|
| S · 2Aq | |
| 0 | 0.01292 |
| 10 | 0.01418 |
| 20 | 0.01510 |
| 25 | 0.01537 |
| 30 | 0.01548 |
| 35 | 0.01554 |
| 40 | 0.01553 |
| 60 | 0.01477 |
| 80 | 0.01361 |
| 100 | 0.01240 |
| S(α) | |
| 100 | 0.00625 |
| 125 | 0.00389 |
| 150 | 0.00220 |
| 175 | 0.00110 |
| 200 | 0.00059 |
| S(β) | |
| 100 | 0.01188 |
| 125 | 0.00662 |
| 150 | 0.00378 |
| 175 | 0.00220 |
| 200 | 0.00121 |

* At 107°, S · 2Aq → S · 0.5Aq. At 63.5°, S · 2Aq → S.

† Metastable equil. above 60°.

**$CaS_2O_3$ (274)**

| $t$, °C | M |
|---|---|
| 9 | 2.72 |

$CaS_2O_6$ (11, 245)

| t, °C | M |
|---|---|
| S · 4Aq | |
| 0 | 0.800 |
| 10 | 1.030 |
| 20 | 1.275 |
| 30 | 1.516 |

$CaSeO_4$ (144)

| t, °C | M ± 10% |
|---|---|
| S · 2Aq | |
| 0 | 0.43 |
| 10 | 0.45 |
| 20 | 0.45 |
| ↓ 30 | 0.43 |
| ↓ 70 | 0.28 |

$Ca(NO_2)_2$ (379)

| t, °C | M ± 3% |
|---|---|
| S · 4Aq | |
| −10 | 4.26 |
| 0 | 4.68 |
| +10 | 5.22 |
| 20 | 5.84 |
| 30 | 6.66 |
| S · 4Aq + S · Aq | |
| 40.3U | 8.00 |
| S · Aq | |
| 50 | 8.98 |
| 60 | 10.14 |
| 70 | 11.58 |
| 80 | 13.8 |
| 90 | 18.1 |

$Ca(NO_3)_2$ (22, 28, 29, 77, 274, 357, 487) (*See* Fig. 15)

| t, °C | M ± 1% |
|---|---|
| S · 4Aq(α) + Ice | |
| −28.7E | 4.58 |
| S · 4Aq(α) | |
| −20 | 4.98 |
| −10 | 5.53 |
| 0 | 6.22 |
| +10 | 7.00 |
| 20 | 7.88 |
| 25 | 8.41 |
| 30 | 9.31 |
| 35 | 10.32 |
| 40 | 11.94 |
| **42.7** | 13.90 |
| S · 4Aq(α) + S · 3Aq | |
| 42.5E | 14.84 |
| S · 4Aq(β) | |
| 30m | 9.78 |
| 35m | 11.05 |
| 38m | 12.19 |
| **39.6m** | 13.90 |
| S · 4Aq(β) + S · 3Aq | |
| 39.5mE | 14.43 |
| S · 3Aq | |
| 40 | 14.43 |
| 45 | 15.25 |
| 50 | 17.15 |
| **51.1** | 18.5 |
| 50 | 20.2 |
| S · 3Aq + S · 2Aq | |
| 48.4E | 21.3 |
| S · 2Aq + S | |
| 51.3U | 21.65 |

$Ca(NO_3)_2$.—(*Continued*)

| t, °C | M ± 1% |
|---|---|
| S | |
| 20m | 20.72 |
| 50m | 21 7 |
| 75 | 22.0 |
| 100 | 22.1 |

$CaCO_3$ (*v.* Vol. III, p. 377)

$Ca(HCO_2)_2$ (267, 305)
Formate

| t, °C | M ± 2% |
|---|---|
| S | |
| 0 | 1.242 |
| ↓ 20 | 1.276 |
| ↓ 100 | 1.414 |

$CaC_3H_2O_4$ (328)
Malonate

| t, °C | M |
|---|---|
| S | |
| 0 | 0.0204 |
| 10 | 0.0232 |
| 20 | 0.0256 |
| 30 | 0.0278 |
| 40 | 0.0297 |
| 50 | 0.0311 |
| 60 | 0.0323 |
| 70 | 0.0332 |

$CaC_4H_4O_4$ (328, 332, 384)
Succinate

| t, °C | M ± 2% |
|---|---|
| S · 3Aq | |
| 0 | 0.0736 |
| 10 | 0.0773 |
| 20 | 0.0813 |
| S · 3Aq + S · Aq | |
| 29U | 0.0850 |
| S · Aq | |
| ↓ 30 | 0.0838 |
| ↓ 70 | 0.0491 |
| 15(484) | 0.083 |
| 100(484) | 0.043 |

$CaC_4H_4O_4$* (328)
Isosuccinate

| t, °C | M ± 5% |
|---|---|
| 0 | 0.0334 |
| 10 | 0.0336 |
| 20 | 0.0331 |
| 30 | 0.0321 |
| 40 | 0.0305 |
| 50 | 0.0282 |
| 60 | 0.0252 |
| 70 | 0.0218 |

* The solid phase is unknown. There may be a transition pt.

$CaC_4H_4O_5$ (78, 132, 246, 384)
*l*-Malate

| t, °C | M* |
|---|---|
| S · Aq | |
| 0 | 0.040 |
| 20 | 0.050 |
| 40 | 0.046 |
| 60 | 0.042 |
| 80 | 0.038 |

* Little agreement. Probably a transition pt. *ca.* 20°.

$CaC_4H_4O_5$ (132)
*dl*-Malate

| t, °C | M |
|---|---|
| 0 | 0.0143 |
| 10 | 0.0160 |
| 20 | 0.0173 |
| 30 | 0.0189 |
| 40 | 0.0202 |

$CaC_4H_4O_6$ (132)*
Tartrate

| S · 4Aq | |
|---|---|
| 0 | 0.0010 |
| 10 | 0.00133 |
| 20 | 0.00173 |
| 30 | 0.00220 |
| 40 | 0.00280 |

* According to (79) the values for M are much higher.

$CaC_4H_4O_6$ (132)
Racemate

| S · 4Aq | |
|---|---|
| 0 | 0.00012 |
| 10 | 0.00016 |
| 20 | 0.00021 |
| 30 | 0.00026 |
| 40 | 0.00051 |

$Ca(CH_3CO_2)_2$ (267, 305)
Acetate

| t, °C | M ± 2% |
|---|---|
| S · 2Aq | |
| 0 | 2.37 |
| 10 | 2.27 |
| 20 | 2.20 |
| 30 | 2.14 |
| 40 | 2.10 |
| 60 | 2.07 |
| 80 | 2.12 |
| S · 2Aq + S · Aq | |
| 84U | 2.14 |
| S · Aq | |
| 85 | 2.09 |
| 90 | 1.97 |
| 100 | 1.88 |

$Ca(C_2H_5CO_2)_2$ (267, 305)
Propionate

| S · Aq | |
|---|---|
| 0 | 2.28 |
| 10 | 2.20 |
| 20 | 2.14 |
| 30 | 2.10 |
| 40 | 2.07 |
| 60 | 2.05 |
| 80 | 2.14 |
| 90 | 2.26 |
| 100 | 2.60 |

$Ca(C_3H_7CO_2)_2$ (82, 121, 216, 305)
Butyrate

| S · Aq | |
|---|---|
| 0 | 0.930 |
| 20 | 0.840 |
| 40 | 0.761 |

$Ca(C_3H_7CO_2)_2$.—(*Continued*)

| t, °C | M ± 2% |
|---|---|
| S · Aq | |
| 60 | 0.709 |
| 70 | 0.700 |
| 80 | 0.700 |
| 100 | 0.740 |

$Ca(C_3H_7CO_2)_2$ (82, 305, 458)
Isobutyrate

| S · 5Aq | |
|---|---|
| 0 | 0.933 |
| 10 | 0.987 |
| ↓ 20 | 1.046 |
| ↓ 60 | 1.327 |
| S · 5Aq + S · Aq | |
| 62U | 1.340 |
| S · Aq | |
| 70 | 1.30 |
| 80 | 1.26 |
| 90 | 1.24 |
| 100 | 1.22 |

$Ca(C_4H_9CO_2)_2$ (332,* 458)
Methylethylacetate

| t, °C | M |
|---|---|
| 0 | 1.19 |
| 20 | 1.39 |
| 40 | 1.45 |
| 60 | 1.37 |
| 70 | 1.27 |

* States that there are hydrates S · 5Aq, S · 3Aq, and S · Aq between 0–90°C, and S · 3Aq + S · Aq at *ca.* 40°.

$Ca(C_4H_9CO_2)_2$ (286)
Trimethylacetate

| S · 5Aq | |
|---|---|
| 0 | 0.300 |
| 10 | 0.282 |
| 20 | 0.270 |
| 30 | 0.264 |
| 40 | 0.265 |
| ↓ 50 | 0.272 |
| ↓ 80 | 0.304 |

$Ca(C_4H_9CO_2)_2$ (176, 305)
*n*-Valerate

| t, °C | M ± 3% |
|---|---|
| S · Aq | |
| 0 | 0.408 |
| 10 | 0.383 |
| 20 | 0.363 |
| 30 | 0.346 |
| 40 | 0.335 |
| 60 | 0.326 |
| 80 | 0.328 |
| 100 | 0.366 |

$Ca(C_4H_9CO_2)_2$ (205, 458*)
Isovalerate

| t, °C | M ± 3% |
|---|---|
| S · 3Aq | |
| 0 | 1.075 |
| 10 | 0.937 |
| 20 | 0.900 |
| 30 | 0.895 |
| 40 | 0.908 |
| S · 3Aq + S · Aq | |
| 45.5U | 0.923 |

$Ca(C_4H_9CO_2)_2$.—(*Continued*)

| *t*, °C | M ± 3% |
|---|---|
| S · Aq | |
| 50 | 0.824 |
| 60 | 0.759 |
| 70 | 0.718 |
| 80 | 0.697 |
| 90 | 0.687 |
| 100 | 0.683 |

* The data of [458] give a continuous curve with a maximum.

$Ca(C_6H_5CO_2)_2$ [474]
Benzoate

| *t*, °C | M ± 1% |
|---|---|
| S · 3Aq | |
| 0 | 0.0789 |
| 10 | 0.0873 |
| 20 | 0.0966 |
| 30 | 0.1071 |
| 40 | 0.1218 |
| 50 | 0.1447 |
| 60 | 0.168 |
| 70 | 0.202 |
| 80 | 0.244 |
| 90m | 0.302 |
| S · 3Aq + S · Aq(?) | |
| 84.7U | 0.270 |
| S · Aq(?) | |
| 80m | 0.261 |
| 90 | 0.281 |
| 100 | 0.309 |
| *t*, °C | M |
| 15 [484] | 0.33 |
| 100 [484] | 0.40 |

$Ca(C_6H_5CH{:}CHCO_2)_2$ [253]
Cinnamate

| | |
|---|---|
| 2 | 0.0058 |
| 15* | 0.0063 |
| 26 | 0.0084 |
| 100* | 0.035 |

* According to [484].

$CaC_{10}H_5NH_2(SO_3)_2$
Naphthylaminedisulfonates
*v.* p. 219

$CaCrO_4$ [360] (*See* Fig. 16)

| *t*, °C | M |
|---|---|
| S · 2Aq(α) | |
| 0m | 1.12 |
| 10m | 0.99 |
| 20m | 0.97 |
| 30m | 0.93 |
| 40m | 0.87 |
| 45m | 0.815 |
| S · 2Aq(β) | |
| 0m | 0.695 |
| 10m | 0.716 |
| 20m | 0.732 |
| 30m | 0.744 |
| 40m | 0.744 |
| S · 2Aq(β) + S · Aq | |
| 14mU | 0.72 |
| S · Aq | |
| 0m | 0.84 |
| 20m | 0.68 |
| 40m | 0.53 |

$CaCrO_4$.—(*Continued*)

| *t*, °C | M |
|---|---|
| S · Aq | |
| 60m | 0.40 |
| 80m | 0.270 |
| 100m | 0.204 |
| S · 0.5Aq | |
| 0m | 0.44 |
| 20m | 0.29 |
| 40m | 0.165 |
| 60m | 0.084 |
| 80m | 0.055 |
| 100m | 0.049 |
| S | |
| 0 | 0.26 |
| 20 | 0.16 |
| 40 | 0.10 |
| 60 | 0.058 |
| 80 | 0.035 |
| 100 | 0.028 |

$Sr(OH)_2$ [419, 436, 444]

| | |
|---|---|
| S · 8Aq | |
| 0 | 0.0338 |
| 10 | 0.0463 |
| 20 | 0.0656 |
| 30 | 0.0975 |
| 40 | 0.145 |
| 50 | 0.209 |
| 60 | 0.302 |
| 70 | 0.439 |
| 80 | 0.72 |
| 85 | 0.96 |
| 90 | 1.34 |
| 95 | 1.75 |
| 100 | 2.28 |

$SrCl_2$ [139, 144, 201, 207, 275, 330, 347, 417, 494)

| *t*, °C | M ± 2% |
|---|---|
| S · 6Aq | |
| −20 | 2.38 |
| −10 | 2.58 |
| 0 | 2.81 |
| +10 | 3.05 |
| 20 | 3.33 |
| 30 | 3.69 |
| 40 | 4.13 |
| 50 | 4.65 |
| 60 | 5.24 |
| S · 6Aq + S · 2Aq | |
| 61.34U | 5.31 |
| S · 2Aq | |
| 70 | 5.54±5% |
| 80 | 5.82±5% |
| 90 | 6.08±5% |

$Sr(ClO_3)_2$ [357]

| *t*, °C | M |
|---|---|
| S | |
| 18 | 6.9 |

$SrBr_2$ [144, 210, 279, 330, 417)

| *t*, °C | M ± 3% |
|---|---|
| S · 6Aq | |
| −10 | 3.22 |
| 0 | 3.46 |
| +10 | 3.72 |
| 20 | 4.00 |

$SrBr_2$.—(*Continued*)

| *t*, °C | M ± 3% |
|---|---|
| S · 6Aq | |
| 30 | 4.31 |
| 40 | 4.65 |
| 50 | 5.02 |
| 60 | 5.42 |
| 70 | 6.00 |
| 80 | 6.93 |
| S · 6Aq + S · 2Aq | |
| 88.6U | 8.54 |
| S · 2Aq | |
| 90 | 8.60 |
| 100 | 9.01 |
| 110 | 9.43 |

$SrI_2$ [144, 279, 330)

| *t*, °C | M ± 5% |
|---|---|
| S · 6Aq | |
| −10 | 4.7 |
| 0 | 4.9 |
| +10 | 5.1 |
| 20 | 5.3 |
| 30 | 5.5 |
| 40* | 5.8* |
| 50 | 6.0 |
| 60 | 6.4 |
| 70 | 6.9 |
| 80 | 7.8 |
| S · 6Aq + S · *x*Aq | |
| 84(?)U | 9.3(?) |
| S · *x*Aq | |
| 100 | 10.5 |

* Above 40° ±10%.

$SrS_2O_6$ [11]

| *t*, °C | M |
|---|---|
| S · 4Aq | |
| 0 | 0.191 |
| 10 | 0.315 |
| 20 | 0.487 |
| 30 | 0.702 |

$Sr(SH)_2$ [489]

| *t*, °C | M ± 2% |
|---|---|
| S · 4Aq | |
| 0 | 2.46 |
| 20 | 2.73 |
| 40 | 3.01 |
| 60 | 3.30 |
| 80 | 3.59 |
| 100 | 3.87 |

$Sr(NO_2)_2$ [379]

| *t*, °C | M ± 3% |
|---|---|
| S · Aq | |
| − 5 | 2.75 |
| +15 | 3.30 |
| 35 | 4.26 |
| 55 | 5.10 |
| 70 | 5.82 |
| 85 | 6.69 |
| 100 | 7.90 |

$Sr(NO_3)_2$ [37, 106, 112, 144, 155, 201, 275, 382)

| *t*, °C | M ± 1% |
|---|---|
| S · 4Aq | |
| −10 | 1.40 |
| 0 | 1.89 |

$Sr(NO_3)_2$.—(*Continued*)

| *t*, °C | M ± 1% |
|---|---|
| S · 4Aq | |
| +10 | 2.55 |
| 20 | 3.34 |
| 25 | 3.75 |
| 30 | 4.10 |
| S · 4Aq + S | |
| 31U | 4.21 |
| S | |
| 40 | 4.30 |
| 60 | 4.46 |
| 80 | 4.62 |
| 100 | 4.80 |

$SrCO_3$ (*v.* Vol. III, p. 377)

$Sr(C_4H_4O_4)$ [484]
Succinate

| *t*, °C | M |
|---|---|
| 15 | 0.0216 |
| 100 | 0.0106 |

$SrC_4H_4O_5$ [78, 132]
*l*-Malate

| | |
|---|---|
| S · 4Aq | |
| 0 | 0.0090 |
| 10 | 0.0135 |
| 20 | 0.0191 |
| 30 | 0.0270 |
| 40 | 0.0397 |

$SrC_4H_4O_5$ [132]
*dl*-Malate

| | |
|---|---|
| S · 2.5Aq | |
| 0 | 0.0131 |
| 10 | 0.0144 |
| 20 | 0.0156 |
| 30 | 0.0214 |
| 40 | 0.0265 |

$SrC_4H_4O_6$ [79, 132]
Tartrate

| | |
|---|---|
| S · 4Aq | |
| 0 | 0.0042 |
| 10 | 0.0061 |
| 20 | 0.0080 |
| 30 | 0.0104 |
| 40 | 0.0130 |
| 50 | 0.0160 |
| 60 | 0.0194 |
| 70 | 0.0238 |
| 80 | 0.0290 |
| 90 | 0.0356 |

$SrC_4H_4O_6$ [132]
Racemate

| | |
|---|---|
| S · 4Aq | |
| 0 | 0.00045 |
| 10 | 0.00079 |
| 20 | 0.00111 |
| 30 | 0.00142 |
| 40 | 0.00173 |

$Sr(CH_3CO_2)_2$ [376]
Acetate

| *t*, °C | M ± 0.5% |
|---|---|
| S · 4Aq | |
| 0 | 1.80 |
| 5 | 1.94 |
| 10m | 2.12 |

**$Sr(CH_3CO_2)_2$.—(*Continued*)**

| *t*, °C | M ± 0.5% |
|---|---|
| S · 4Aq + S · 0.5Aq | |
| 9.5U | 2.10 |
| S · 0.5Aq | |
| 10 | 2.09 |
| 20 | 1.99 |
| 40 | 1.86 |
| 60 | 1.78 |
| 80 | 1.76 |
| 100 | 1.77 |

**$Sr(C_6H_5CO_2)_2$ (380)**
Benzoate

| *t*, °C | M |
|---|---|
| 15* | 0.166 |
| 15 | 0.168 |
| 25 | 0.172 |
| 35 | 0.178 |
| 100* | 0.180 |

* According to (484).

**$Sr(C_6H_5CH{:}CHCO_2)_2$ (484)**
Cinnamate

| | |
|---|---|
| 15 | 0.031 |
| 100 | 0.084 |

**$SrC_{10}H_6NH_2(SO_3)_2$**
Naphthylaminedisulfonates
*v.* p. 219

**$Ba(OH)_2$ (221, 224, 330, 382, 410, 419, 434, 454, 465)**

| *t*, °C | M ± 2% |
|---|---|
| S · 8Aq | |
| 0 | 0.099 |
| 5 | 0.125 |
| 10 | 0.158 |
| 15 | 0.193 |
| 20 | 0.233 |
| 25 | 0.275 |
| 30 | 0.330 |
| 40 | 0.48 |
| 50 | 0.76 |
| 60 | 1.24 |
| 65 | 1.58 |
| 70 | 2.24 |
| S · 8Aq + S · 4(?)Aq | |
| 78.0U | |

**$BaCl_2$ (139, 201, 312, 330, 344, 363, 447, 450, 453, 485)**

| | |
|---|---|
| S · 2Aq | |
| −10 | 1.46 |
| 0 | 1.52 |
| +10 | 1.61 |
| 20 | 1.72 |
| 30 | 1.83 |
| ↓ 40 | 1.94 |
| ↓ 100 | 2.82 |

**$Ba(ClO_2)_2$ (290)**

| *t*, °C | M ± 3% |
|---|---|
| 0 | 1.61 |
| 20 | 1.62 |
| 40 | 1.73 |
| 60 | 2.00 |
| 80 | 2.94 |
| 100 | 2.97 |

**$Ba(ClO_3)_2$ (80, 503)**

| *t*, °C | M |
|---|---|
| · Aq | |
| 0 | 0.65 |
| 10 | 0.88 |
| 20 | 1.11 |
| 30 | 1.37 |
| 40 | 1.64 |
| 60 | 2.20 |
| 80 | 2.79 |
| 100 | 3.48 |
| 105 | 3.67 |

**$Ba(ClO_4)_2$ (80)**

| | |
|---|---|
| 0 | 6.4 |
| ↓ 20 | 8.5 |
| ↓ 100 | 17.0 |

**$BaBr_2$ (144, 278, 330)**

| *t*, °C | M ± 5% |
|---|---|
| S · 2Aq | |
| −20 | 2.8 |
| 0 | 3.1 |
| +20 | 3.4 |
| 25 | 3.52 |
| 40 | 3.7 |
| 60 | 4.0 |
| 80 | 4.3 |
| 100 | 4.6 |

**$Ba(BrO_3)_2$ (206, 503)**

| *t*, °C | M ± 0.5% |
|---|---|
| S · Aq | |
| 0 | 0.00730 |
| 10 | 0.01121 |
| 20 | 0.01668 |
| 25 | 0.02018 |
| 30 | 0.02441 |
| 40 | 0.03375 |
| 50 | 0.0445 |
| 60 | 0.0590 |
| 70 | 0.0763 |
| 80 | 0.0928 |
| 90 | 0.1129 |
| 100 | 0.148 |

**$BaI_2$ (144, 279, 330)**

| *t*, °C | M ± 3% |
|---|---|
| S · 6Aq | |
| −10 | 3.90 |
| 0 | 4.33 |
| +10 | 4.77 |
| 20 | 5.20 |
| 30 | 5.64 |
| S · 6Aq + S · 2Aq | |
| 40U | 6.06 |
| S · 2Aq | |
| ↓ 50 | 6.20 |
| ↓ 100 | 6.93 |

[*Cf.* however the recent determinations by (537).]

**$Ba(IO_3)_2$ (211*, 503)**

| *t*, °C | M |
|---|---|
| S · Aq | |
| 0 | 0.000164 |
| 10 | 0.000285 |
| 20 | 0.000450 |
| 25 | 0.000540 |

**$Ba(IO_3)_2$.—(*Continued*)**

| *t*, °C | M |
|---|---|
| S · Aq | |
| 30 | 0.000635 |
| 40 | 0.00084 |
| 50 | 0.00115 |
| 60 | 0.00149 |
| 70 | 0.00190 |
| 80 | 0.00236 |
| 90 | 0.00290 |

* At 25° gives M = 0.000792.

**$BaSO_3$ (428)**

| | |
|---|---|
| 20 | 0.00091 |

**$BaS_2O_6$ (11)**

| *t*, °C | M ± 1% |
|---|---|
| S · 2Aq | |
| 0 | 0.286 |
| 10 | 0.443 |
| 20 | 0.629 |
| 30 | 0.833 |

**$Ba(SH)_2$ (488)**

| *t*, °C | M |
|---|---|
| S · 4Aq | |
| −20 | 2.30 |
| 0 | 2.38 |
| +20 | 2.45 |
| 40 | 2.59 |
| 60 | 2.79 |
| 80 | 3.15 |
| 100 | 3.81 |

**$BaSeO_4$ (325)**

| | S |
|---|---|
| 25 | 0.000288 |

**$Ba(NO_2)_2$ (379)**

| *t*, °C | M ± 3% |
|---|---|
| S · Aq | |
| −10 | 2.27 |
| 0 | 2.39 |
| +10 | 2.59 |
| 20 | 2.93 |
| 30 | 3.49 |
| 40 | 4.22 |
| 50 | 5.10 |
| 60 | 6.06 |
| 70 | 7.13 |
| 80 | 8.7 |
| 90 | 10.6 |
| 100 | 13.9 |
| 110 | 19.8 |

**$Ba(NO_3)_2$ (104, 106, 144, 145, 155, 201, 312, 363, 382)**

| *t*, °C | M ± 2% |
|---|---|
| | S |
| 0 | 0.190 |
| 10 | 0.262 |
| 20 | 0.359 |
| 30 | 0.445 |
| 40 | 0.550 |
| 50 | 0.660 |
| ↓ 60 | 0.780 |
| ↓ 100 | 1.32 |

**$BaCO_3$** (*v.* Vol. III, p. 377)

**$BaC_3H_2O_4$ (328)**
Malonate

| *t*, °C | M |
|---|---|
| S · 2Aq(?) | |
| 0 | 0.0059 |
| 10 | 0.0074 |
| 20 | 0.0088 |
| 30 | 0.0101 |
| 40 | 0.0111 |
| 50 | 0.0120 |
| 60 | 0.0128 |
| 70 | 0.0132 |

**$BaC_4H_4O_4$ (328)**
Isosuccinate

| | S |
|---|---|
| 0 | 0.076 |
| 10 | 0.112 |
| 20 | 0.142 |
| 30 | 0.164 |
| 40 | 0.179 |
| 50 | 0.185 |
| 60 | 0.184 |
| 70 | 0.174 |

**$BaC_4H_4O_4$ (328, 384)**
Succinate

| | S |
|---|---|
| 0 | 0.0168 |
| 10 | 0.0170 |
| 15* | 0.0159 |
| 20 | 0.0164 |
| 30 | 0.0156 |
| 40 | 0.0145 |
| 50 | 0.0133 |
| 70 | 0.0108 |
| 100* | 0.0081 |

* (484).

**$BaC_4H_4O_5$ (78, 132, 384)**
*l*-Malate

| | | S |
|---|---|---|
| 0 | | 0.029 |
| 20 | | 0.032 |
| 40 | * | 0.035 |
| 60 | | 0.038 |
| 80 | | 0.040 |
| 0 | | 0.038 |
| 20 | † | 0.046 |
| 40 | | 0.053 |

* (78). † (132, 384).

**$BaC_4H_4O_6$ (79, 132)**
Tartrate

| | S |
|---|---|
| S · 0.5Aq(?) | |
| 0 | 0.00070 |
| 10 | 0.00084 |
| 20 | 0.00096 |
| 30 | 0.00110 |
| 40 | 0.00124 |
| 60 | 0.00154 |
| 80 | 0.00188 |

**$BaC_4H_4O_6$ (132)**
Racemate

| | S |
|---|---|
| 0 | 0.00085 |
| 10 | 0.00096 |
| 20 | 0.00108 |
| 30 | 0.00120 |
| 40 | 0.00131 |

**$Ba(CH_3CO_2)_2$ (267, 516)**
Acetate

| $t$, °C | M ± 1% |
|---|---|
| S · 3Aq | |
| 0 | 2.27 |
| 10 | 2.50 |
| 20 | 2.79 |
| 25m | 3.02 |
| S · 3Aq + S · Aq | |
| 23U | 2.90 |
| S · Aq | |
| 30 | 2.94 |
| 35 | 2.98 |
| 40 | 3.05 |
| S · Aq + S | |
| 42U | 3.08 |
| S | |
| 45 | 3.05 |
| 50 | 3.01 |
| 60 | 2.94 |
| 70 | 2.89 |
| 80 | 2.88 |
| 90 | 2.90 |
| 100 | 2.94 |

**$Ba(C_2H_5CO_2)_2$ (267, 525)**
Propionate

| $t$, °C | M |
|---|---|
| 0 | 2.02 |
| 10 | 1.98 |
| 20 | 1.97 |
| 30 | 2.01 |
| 40 | 2.05 |
| 50 | 2.12 |
| 60 | 2.19 |
| 70 | 2.28 |
| 80 | 2.41 |
| 90 | 2.58 |
| 100 | 2.85 |

**$Ba(C_3H_7CO_2)_2$ (121)**
Butyrate

| S · 2Aq(?) | |
|---|---|
| 0 | 1.20 |
| 10 | 1.18 |
| 20 | 1.16 |
| 30 | 1.15 |
| 40 | 1.15 |
| 50 | 1.17 |
| 60 | 1.21 |
| 70 | 1.27 |

**$Ba(C_5H_9O_2)_2$ (286)**
Trimethylacetate

| S · 5Aq | |
|---|---|
| 0 | 1.01 |
| 20 | 0.97 |
| 40 | 0.94 |

**$Ba(C_4H_9CO_2)_2$ (176)**
*n*-Valerate

| | |
|---|---|
| 0 | 0.64 |
| 10 | 0.61 |
| 20 | 0.59 |
| 30 | 0.58 |
| 40 | 0.58 |
| 50 | 0.59 |
| 60 | 0.61 |
| 70 | 0.64 |

**$Ba(C_6H_5CO_2)_2$ (484)**
Benzoate

| $t$, °C | M |
|---|---|
| 15 | 0.118 |
| 100 | 0.295 |

**$Ba(C_6H_5CH:CHCO_2)_2$ (484)**
Cinnamate

| | |
|---|---|
| 15 | 0.0167 |
| 100 | 0.054 |

**$BaC_3H_4O_5S$ (170)**
*dl*-Sulfopropionate

| | |
|---|---|
| 24.6 | 0.246 |

**$Ba[C_6H_2(NO_2)_3O]_2$ (156)**
Picrate

| S · 5Aq | |
|---|---|
| 25 | 0.0212 |

**$Ba[C_6H_2(NO_2)_2OHCO_2]_2$ (156)**
Dinitrosalicylate

| S | |
|---|---|
| 25 | 0.0107 |

**$BaC_{10}H_5NH_2(SO_3)_2$**
Naphthylaminedisulfonates
*v.* p. 219

**$BaCl_2.CdCl_2$ (421)**

| $t$,° C | M ± 3% |
|---|---|
| S · 4Aq | |
| 20 | 1.80 |
| 40 | 2.22 |
| 60 | 2.75 |
| 80 | 3.42 |
| 100 | 4.28 |

**$BaCl_2.2CdCl_2$ (421)**

| S · 5Aq | |
|---|---|
| 20 | 1.43 |
| 40 | 1.66 |
| 60 | 1.93 |
| 80 | 2.28 |
| 100 | 2.68 |

**$RaSO_4$ (297)**

| $t$, °C | M |
|---|---|
| 25 | $6.5 \times 10^{-3}$ |

**LiOH (128, 393, 449)**

| $t$, °C | M ± 3% |
|---|---|
| S · Aq | |
| 10 | 5.30 |
| 20 | 5.32 |
| 30 | 5.36 |
| 40 | 5.42 |
| 50 | 5.53 |
| 60 | 5.72 |
| 70 | 6.00 |
| 80 | 6.38 |

**LiF (357)**

| $t$, °C | M |
|---|---|
| 18 | 0.104 |

**LiCl (47, 48, 139, 222, 278, 279, 396, 397)**

| $t$, °C | M ± 5% |
|---|---|
| S · 2Aq | |
| 0 | 15.3 |
| 10 | 17.3 |
| S · 2Aq + S · Aq | |
| 12.5U | 17.8 |

**LiCl.**—*(Continued)*

| $t$, °C | M ± 5% |
|---|---|
| S · Aq | |
| 20 | 18.8 |
| 40 | 21.2 |
| 60 | 24.0 |
| 80 | 27.1 |
| S · Aq + S | |
| 98U | 30.7 |
| S | |
| 100 | 30.8 |
| 120 | 31.7 |
| 140 | 32.8 |
| 160 | 34.2 |

**$LiClO_3$ (267.5)**

| $t$, °C | Wt. % $H_2O$ |
|---|---|
| $S_I$ | |
| 127.6 | 0.0 |
| 120.3 | 1.44 |
| 115.3 | 2.46 |
| 107.7 | 3.68 |
| 103.4 | 4.44 |
| 100.2 | 4.91 |
| $S_I + S_{II}$ | |
| 99 | 5.1 |
| $S_{II}$ | |
| 95.7 | 5.65 |
| 92.3 | 6.32 |
| 85.8 | 7.46 |
| 78.9 | 8.61 |
| 71.3 | 9.72 |
| 67.2 | 10.57 |
| 48.3 | 12.83 |
| 36.9m | 13.73 |
| $S_{II} + S_{III}$ | |
| 42 | 13.4 |
| $S_{III}$ | |
| 43.9m | 12.83 |
| 39.6 | 13.73 |
| 36.8 | 14.64 |
| 32.0 | 16.09 |
| 27.2 | 17.33 |
| 22.1 | 18.32 |
| 12.8m | 20.74 |
| +2.9m | 22.41 |
| −3.2m | 23.41 |
| $S_{III}$ + S · Aq | |
| 21.5 | 18.8 |
| S · Aq | |
| 20.5 | 19.73 |
| 18.9 | 21.46 |
| 16.7 | 22.75 |
| 14.1 | 23.41 |
| 12.0 | 25.03 |
| 9.1 | 26.26 |
| 6.8 | 27.20 |
| 5.1 | 27.61 |
| 3.8 | 28.11 |
| 0.9 | 28.82 |
| S · Aq + S · 3Aq | |
| + 1.5E | 28.9 |
| S · 3Aq | |
| −13.6m | 22.75 |
| − 7.8m | 24.55 |
| − 7.3m | 25.03 |
| − 5.8m | 25.37 |

**$LiClO_3$.**—*(Continued)*

| $t$, °C | Wt. % $H_2O$ |
|---|---|
| S · 3Aq | |
| 0.0m | 28.11 |
| + 3.4 | 30.26 |
| 4.5 | 31.61 |
| 6.0 | 32.82 |
| 6.8 | 33.89 |
| 7.4 | 35.12 |
| 7.9 | 36.56 |
| **8.0** | 37.4 |
| 7.85 | 38.49 |
| 7.3 | 39.85 |
| 6.1 | 41.84 |
| 4.8 | 43.34 |
| 2.2 | 45.43 |
| + 0.5 | 46.73 |
| − 1.8 | 48.05 |
| − 4.8 | 49.51 |
| − 7.3 | 51.04 |
| − 8.8 | 52.06 |
| −15.7 | 54.65 |
| −33.9 | 60.95 |
| −37.1 | 61.9 |
| −39.0 | 62.58 |
| S · 3Aq + Ice | |
| −40E | 63.0 |
| $S_{II}$ + S · 3Aq | |
| −25mE | 19 |
| $S_{III}$ + S · 3Aq | |
| − 9mE | 24.3 |

**LiBr (47, 48, 279)**

| $t$, °C | M ± 10% |
|---|---|
| S · 2Aq | |
| 20 | 20 |
| S · 2Aq + S · Aq | |
| 44U | 24 |
| S · Aq | |
| 60 | 25.5 |
| 80 | 27.5 |
| 100 | 30.5 |

**$LiBrO_3$ (357)**

| $t$, °C | M |
|---|---|
| S | |
| 18 | 11.4 |

**LiI (47, 48, 279)**

| S · 3Aq | |
|---|---|
| 0 | 11.0±10% |
| 20 | 12.0±10% |
| 40 | 13.0±10% |
| 60 | 14.5±10% |

**$LiIO_3$ (357)**

| | |
|---|---|
| S | |
| 18 | 4.42 |

**$Li_2SO_4$ (144, 276, 311, 450, 452, 453)**

| S · Aq(?) | |
|---|---|
| −20 | 2.05 |
| −15 | 2.72 |
| −10 | 3.02 |
| 0 | 3.18 |
| +10 | 3.16 |
| 20 | 3.12 |
| 100 | 2.64 |

**$Li_2SeO_3$ (431)**

| $t$, °C | M ± 3% |
|---|---|
| S · 0.75Aq | |
| 0 | 1.77 |
| 20 | 1.51 |
| 40 | 1.26 |
| 60 | 1.06 |
| 80 | 0.87 |
| 100 | 0.70 |

**$LiNO_3$ (379)**

| $t$, °C | $x$ |
|---|---|
| S · Aq | |
| −40 | 0.110 |
| −20 | 0.148 |
| 0 | 0.196 |
| +20 | 0.245 |
| 40 | 0.302 |
| S · Aq + S · 0.5Aq | |
| 49U | 0.345 |
| S · 0.5Aq | |
| 60 | 0.363 |
| 70 | 0.388 |
| 80 | 0.420 |
| 90 | 0.475 |
| 95 | 0.568 |
| **96.5** | 0.667 |
| 95 | 0.785 |

**$LiNO_3$ (130, 278, 311)**

| $t$, °C | M ± 3% |
|---|---|
| S · 3Aq | |
| 0 | 7.3 |
| 10 | 8.4 |
| 20 | 10.5 |
| 25 | 12.4 |
| 29 | 16.0 |
| **29.88** | 18.5 |
| S · 3Aq + S · 0.5Aq | |
| 29.6E | 20.0 |
| S · 0.5Aq | |
| 30 | 20.1 |
| 40 | 21.5 |
| 50 | 23.3 |
| 60 | 25.6 |
| S · 0.5Aq + S | |
| 61U | 26.0 |
| S | |
| 70 | 27.6 |
| 80 | 29.6 |
| 90 | 31.6 |
| 100 | 33.9 |
| 110 | 36.5 |

**$Li_3SbS_4$ (127)**

| $t$, °C | M |
|---|---|
| S · 10Aq | |
| −40 | 2.50 |
| −20 | 2.83 |
| 0 | 3.14 |
| ↓ +20 | 3.47 |
| 50 | 3.95 |

**$Li_2CO_3$ (38, 84, 179, 278, 432, 436)**

| $t$, °C | M ± 3% |
|---|---|
| S(?) | |
| **0** | 0.208 |
| **10** | 0.193 |

**$Li_2CO_3$.—(*Continued*)**

| $t$, °C | M ± 3% |
|---|---|
| S(?) | |
| 20 | 0.180 |
| ↓ 25 | 0.1723* |
| 100 | 0.090 |

* ±0.5 %.

**$Li_2C_2O_4$ (165)**
Oxalate

| $t$, °C | M |
|---|---|
| S | |
| 25 | 0.61 |

**$LiHCO_2$ (194)**
Formate

| $t$, °C | M ± 2% |
|---|---|
| S · Aq | |
| −20 | 5.20 |
| 0 | 6.20 |
| +20 | 7.60 |
| 40 | 9.5 |
| 60 | 12.4 |
| 80 | 17.6 |
| 90 | 22.0 |
| S · Aq + S | |
| 94U | 25.1 |
| S | |
| 100 | 25.7 |
| 120 | 28.3 |

**$LiHCO_3$ (38)**

| $t$, °C | M |
|---|---|
| 13 | 0.81 |

**$LiCH_3CO_2$ (464)**
Acetate

| | |
|---|---|
| S · 2Aq | |
| 0 | 4.69 |
| 10 | 5.11 |
| 20 | 5.77 |
| 30 | 7.77 |
| 40 | 10.4 |
| 50 | 14.6 |
| 55 | 18.7 |
| **57.8** | 27.8 |
| S · 2Aq + S | |
| 57.8EU | 29.1 |
| S | |
| 60 | 29.1 |
| 80 | 29.3 |
| 100 | 30.1 |
| 150 | 36.1 |
| 200 | 56.4 |
| 250 | 142.6 |
| **286** | ∞ |

**$Li_2C_4H_4O_8$ (152)**
Dihydroxytartrate

| | |
|---|---|
| 0 | 0.0041 |

**$LiC_6H_5CO_2$ (463)**
Benzoate

| $t$, °C | M ± 2% |
|---|---|
| S · Aq | |
| 0 | 3.03 |
| 10 | 3.26 |
| 20 | 3.49 |
| 30 | 3.76 |
| S · Aq + S | |
| 34U? | 3.88 |

**$LiC_6H_5CO_2$.—(*Continued*)**

| $t$, °C | M ± 2% |
|---|---|
| S | |
| 40 | 3.90 |
| 80 | 4.10 |
| 120 | 4.66 |
| 160 | 6.12 |
| 176 | 7.54 |

**$LiC_7H_5O_3$ (463)**
*o*-Hydroxybenzoate

| | |
|---|---|
| S · 6Aq | |
| −10 | 5.62 |
| − 5 | 6.12 |
| 0 | 6.84 |
| + 3.5m | 7.80 |
| S · 6Aq + S · Aq | |
| 1U | 7.02 |
| S · Aq | |
| 10 | 7.74 |
| 20 | 8.82 |
| 30 | 10.22 |
| 40 | 11.82 |
| 50 | 13.60 |
| S · Aq + S | |
| 51U | 13.80 |
| S | |
| 50m | 13.66 |
| 60 | 14.48 |
| 80 | 16.16 |
| 100 | 18.04 |
| 120 | 20.42 |
| 138 | 24.10 |

**$LiC_7H_5O_3$ (463)**
*m*-Hydroxybenzoate

| | |
|---|---|
| S | |
| 10 | 8.65 |
| 20 | 8.71 |
| 40 | 8.90 |
| 60 | 9.20 |
| 80 | 9.77 |
| 100 | 10.71 |
| 120 | 12.40 |

**$LiC_7H_5O_3$ (463)**
*p*-Hydroxybenzoate

| | |
|---|---|
| S | |
| 0 | 3.10 |
| 20 | 3.10 |
| 40 | 3.11 |
| 60 | 3.16 |
| 80 | 3.24 |
| 100 | 3.45 |
| 115 | 3.82 |

**$Li_2SnO_3$ (535)**

| $t$, °C | M |
|---|---|
| S · 5Aq | |
| 30 | 0.116 |
| 40 | 0.127 |
| 50 | 0.139 |
| 60 | 0.152 |
| 70 | 0.164 |
| 80 | 0.178 |
| S · 3Aq | |
| 30m | 0.186 |
| 40m | 0.192 |
| 50m | 0.202 |
| 60m | 0.216 |

**$Li_2SnO_3$.—(*Continued*)**

| $t$, °C | M |
|---|---|
| S · 3Aq | |
| 70m | 0.235 |
| 80m | 0.262 |

**$LiAuCl_4$ (429)**

| | |
|---|---|
| S · 4Aq(?)* | |
| 10 | 3.28 |
| 20 | 3.92 |
| 30 | 4.80 |
| 40 | 5.96 |
| 50 | 7.42 |
| 60 | 9.36 |
| 70 | 12.3 |

* M. P. would be 73°, M = 13.9

**$Li_2Pt(CN)_6$ (491)**

| | |
|---|---|
| ? | |
| 0 | 3.35 |
| S · 5Aq | |
| 15 | 4.44 |
| 20 | 4.50 |
| 25 | 4.62 |
| 30m | 4.91 |
| 40m | 5.74 |
| 45m | 6.29 |
| S · 5Aq + S · $x_1$Aq | |
| 29U | 4.85 |
| S · $x_1$Aq | |
| 25m | 4.85 |
| 30 | 4.85 |
| 35 | 4.94 |
| 40m | 5.12 |
| S · $x_1$Aq + S · $x_2$Aq | |
| 39U | 5.08 |
| S · $x_2$Aq | |
| 40 | 5.10 |
| 50m | 5.56 |
| 52.5m | 5.78 |
| S · $x_2$Aq + S · $x_3$Aq | |
| 49.5U | 5.52 |
| S · $x_3$Aq | |
| 55 | 5.56 |
| 60 | 5.68 |
| 65 | 5.96 |
| S · $x_3$Aq + S · $x_4$Aq | |
| 69U | 6.52 |
| S · $x_4$Aq | |
| 70 | 6.55 |
| 80 | 6.84 |
| 90 | 7.68 |

Transition pts.: Dilatometric, 26°, 38°, 46°, 69°. Curve, 29°, 39°, 49.5°, 69°.

**$Li_2CrO_4$ (357, 449)**

| | |
|---|---|
| S · 2Aq | |
| 18 | 8.5 |
| 30 | 7.7 |

**$Li_2Cr_2O_7$ (449)**

| | |
|---|---|
| 30 | 5.67 |

**$Li_2MoO_4$ (432)**

| $t$, °C | M ± 3% |
|---|---|
| S · 0.75Aq | |
| 0 | 4.74 |
| ↓ 20 | 4.63 |
| 100 | 4.24 |

**$Li_3VO_4$ (432)**

| $t$, °C | M |
|---|---|
| S · 9Aq | |
| 0 | 0.181 |
| 10 | 0.250 |
| 20 | 0.338 |
| 30 | 0.441 |
| S · 9Aq + S · Aq | |
| 31.5U | 0.46 |
| S · Aq | |
| 35 | 0.41 |
| 40 | 0.35 |
| 50 | 0.24 |
| 55 | 0.20 |

**$LiBO_2$ (288, 432)**

| $t$, °C | M ± 4% |
|---|---|
| S · 8Aq | |
| 0 | 0.164 |
| 10 | 0.284 |
| 20 | 0.49 |
| 30 | 0.98 |
| 40 | 2.32 |
| 44 | 3.36 |
| 46 | 4.66 |
| **47.1** | 6.94 |
| 46 | 8.6 |
| 42 | 10.4 |

**NaOH (133, 168, 171, 191, 359, 393, 449, 454)** (*See* Fig. 17)

| $t$, °C | M |
|---|---|
| S · 7Aq | |
| −28 | 5.90 |
| −26 | 6.38 |
| −24m | 7.22 |
| **−23.5m** | 7.93 |
| −24m | 8.74 |
| −26m | 9.80 |
| S · 5Aq | |
| −30m | 6.30 |
| −25m | 6.96 |
| −20 | 7.78 |
| −15m | 8.94 |
| −13m | 9.74 |
| **−12.3m** | 11.10 |
| −13m | 11.80 |
| S · 4Aq(α) | |
| −20m | 8.00 |
| −15 | 8.40 |
| −10 | 8.90 |
| − 5 | 9.56 |
| 0 | 10.50 |
| + 5m | 11.86 |
| **7.8m** | 13.88 |
| 6m | 15.90 |
| S · 4Aq(β) | |
| −10m | 10.54 |
| − 8m | 11.04 |
| − 6m | 11.60 |
| − 4m | 12.22 |
| − 2m | 13.16 |
| **− 1.4m** | 13.88 |
| 0m | 14.60 |
| S · 3.5Aq | |
| **−10m** | 10.30 |
| − 5m | 10.56 |

**NaOH.**—(*Continued*)

| $t$, °C | M |
|---|---|
| S · 3.5Aq | |
| 0m | 10.98 |
| + 5 | 11.64 |
| 10 | 12.80 |
| 15 | 14.76 |
| **15.8** | 15.84 |
| 15 | 17.50 |
| 10 | 20.06 |
| 5m | 21.42 |
| S · 3Aq | |
| − 2m | 14.86 |
| 0m | 15.78 |
| + 2m | 17.00 |
| **2.8m** | 18.50 |
| 2m | 19.14 |
| 1m | 19.54 |
| S · 2Aq | |
| 0m | 18.66 |
| 2m | 19.48 |
| 4m | 20.38 |
| 6 | 21.30 |
| 8 | 22.40 |
| 10 | 23.74 |
| 12 | 25.66 |
| **12.8m** | 27.75 |
| S · Aq | |
| 0m | 24.2 |
| 5m | 24.8 |
| 10m | 25.5 |
| 15 | 26.3 |
| 20 | 27.2 |
| 25 | 28.3 |
| 30 | 29.6 |
| 35 | 31.0 |
| 40 | 32.2 |
| 45 | 34.1 |
| 50 | 36.2 |
| 55 | 39.4 |
| 60 | 44.0 |
| 64 | 51.6 |
| **64.5** | 55.5 |
| 64 | 61.0 |
| 62 | 68.6 |
| S | |
| 60 | 73.0 |
| 80 | 78.5 |
| 100 | 84.7 |
| 120 | 91 |
| 140 | 98 |
| 160 | 106 |
| 180 | 116 |
| 190 | 124 |
| S · 7Aq + S · 5Aq | |
| −24.3U | 7.0 |
| S · 5Aq + S · 4Aq(α) | |
| −18.0U | 8.2 |
| S · 4Aq(α) + S · 3.5Aq | |
| 3.6U | 11.4 |
| S · 4Aq(β) + S · 3.5Aq | |
| −11.0mU | 10.3 |
| S · 4Aq(β) + S · 3Aq | |
| − 2.3mE | 14.8 |

**NaOH.**—(*Continued*)

| $t$, °C | M |
|---|---|
| S · 3.5Aq + S · 2Aq | |
| + 5.9E | 21.2 |
| S · 3Aq + S · 2Aq | |
| 1.6mE | 19.3 |
| S · 2Aq + S · Aq | |
| 12.2U | 25.5 |
| S · Aq + S | |
| 60E | 72.9 |

**NaF (63, 87, 125, 172, 357)**

| $t$, °C | M ± 3% |
|---|---|
| S | |
| 15 | 1.00 |
| 25 | 1.00 |
| 100 | 1.02 |

**NaCl (5, 8, 36, 43, 44, 45, 46, 63, 90, 97, 105, 106, 144, 149, 171, 199, 202, 222, 224, 233, 312, 326, 338, 339, 374, 405, 424, 426, 441, 447, 454, 465, 482, 485, 495, 500, 501)**; *cf.* **(540)**

| $t$, °C | M ± 0.2% |
|---|---|
| S · 2Aq + Ice | |
| −21.1E | 5.20 |
| S · 2Aq | |
| −20 | 5.28 |
| −15 | 5.48 |
| −10 | 5.69 |
| − 5 | 5.90 |
| S · 2Aq + S | |
| + 0.15U | 6.10 |
| S | |
| 0m | 6.10 |
| 5 | 6.10 |
| 10 | 6.11 |
| 15 | 6.12 |
| 20 | 6.13 |
| 25 | 6.145 |
| 30 | 6.165 |
| 35 | 6.18 |
| 40 | 6.215 |
| 45 | 6.24 |
| 50 | 6.26 |
| 55 | 6.29 |
| $t$, °C | M ± 0.5% |
| 60 | 6.33 |
| 65 | 6.37 |
| 70 | 6.41 |
| 75 | 6.45 |
| 80 | 6.50 |
| 85 | 6.55 |
| 90 | 6.60 |
| 95 | 6.65 |
| 100 | 6.70 |
| 110 | 6.81 |
| 120* | 6.93 |
| 130 | 7.06 |
| 140 | 7.19 |
| 150 | 7.32 |
| 160 | 7.45 |
| 170 | 7.58 |
| 180 | 7.71 |

* Accuracy unknown at 120° and higher.

**$NaClO_3$ (63, 80, 192, 277, 281, 374)**

| $t$, °C | M ± 3% |
|---|---|
| S | |
| 0 | 7.5 |
| 20 | 9.2 |
| 40 | 11.1 |
| 60 | 13.4 |
| 80 | 16.1 |
| 100 | 19.4 |
| $t$, °C | M* ± 2% |
| 20 | 6.78 |
| 30 | 7.23 |
| 40 | 7.70 |
| 50 | 8.14 |
| 60 | 8.58 |
| 70 | 9.02 |
| 80 | 9.41 |
| 90 | 9.69 |
| 100 | 10.43 |

* Per 1 soln.

**$NaClO_4$ (80)**

| $t$, °C | M |
|---|---|
| S · Aq | |
| 15 | 14.9 |
| 50 | 20.2 |
| S | |
| 140 | 30.6 |

**NaBr (63, 90, 105, 200, 277)**; *cf.* **(540)**

| $t$, °C | M ± 2% |
|---|---|
| S · 2Aq | |
| −20 | 6.98 |
| −10 | 7.32 |
| 0 | 7.71 |
| +10 | 8.17 |
| 20 | 8.77 |
| 30 | 9.46 |
| 40 | 10.31 |
| S · 2Aq + S | |
| 50U | 11.29 |
| S | |
| 60 | 11.38 |
| 80 | 11.60 |
| 100 | 11.84 |
| 120 | 12.13 |

**$NaBrO_3$ (277)**

| $t$, °C | M |
|---|---|
| S | |
| ↓ 0 | 1.82 |
| 60 | 4.14 |
| 80 | 5.04 |

**NaI (63, 90, 105, 200, 277)**; *cf.* **(540)**

| $t$, °C | M ± 2% |
|---|---|
| S · 2Aq | |
| −15 | 9.95 |
| −10 | 10.20 |
| 0 | 10.72 |
| +10 | 11.31 |
| 20 | 11.98 |
| 30 | 12.75 |
| 40 | 13.75 |
| 50 | 15.13 |
| 60 | 17.18 |

**NaI.**—(*Continued*)

| *t*, °C | M ± 2% |
|---|---|
| S · 2Aq + S | |
| 68.9U | 19.59 |
| S | |
| 70 | 19.60 |
| 80 | 19.80 |
| 90 | 20.00 |
| 100 | 20.24 |

**$NaIO_3$** (277, 316)

| *t*, °C | M ± 10% |
|---|---|
| S · 1.5Aq | |
| ↓ 0 | 0.142 |
| ↓ 50 | 0.882 |
| 60 | 1.046 |
| 80 | 1.402 |

**$Na_2S$** (381)

| *t*, °C | M ± 3% |
|---|---|
| S · 9Aq | |
| 10 | 1.98 |
| 20 | 2.34 |
| 30 | 2.91 |
| 40 | 3.63 |
| 50 | 4.03 |
| S · 9Aq + S · 6Aq | |
| 52U | 4.70 |
| S · 9Aq + S · 5.5Aq | |
| 58mU | 5.32 |
| S · 6Aq | |
| 50m | 4.67 |
| 60 | 5.01 |
| 70 | 5.56 |
| 80 | 6.30 |
| 90 | 7.34 |
| S · 5.5Aq | |
| 50m | 5.12 |
| 60m | 5.40 |
| 70m | 5.90 |
| 80m | 6.59 |
| 90m | 7.59 |

**$Na_2SO_3$** (158, 213)

| *t*, °C | M ± 1% |
|---|---|
| S · 7Aq | |
| 0 | 1.09 |
| 10 | 1.52 |
| 20 | 2.08 |
| 30 | 2.80 |
| S · 7Aq + S | |
| 33.4U | 3.09 |
| S | |
| 40 | 2.95 |
| 50 | 2.76 |
| 60 | 2.59 |
| 70 | 2.43 |
| 80 | 2.30 |
| 90 | 2.20 |
| 100 | 2.14 |

**$Na_2SO_4$** (36, 43, 44, 45, 63, 106, 144, 164, 200, 222, 302, 311, 378, 385, 409, 415, 418, 424, 447, 454, 456, 483, 495)

(*See* Fig. 18)

| *t*, °C | M ± 1% |
|---|---|
| S · 10Aq | |
| 0 | 0.342 |

**$Na_2SO_4$.**—(*Continued*)

| *t*, °C | M ± 1% |
|---|---|
| S · 10Aq | |
| 5 | 0.428 |
| 10 | 0.628 |
| 15 | 0.920 |
| 20 | 1.33 |
| 25 | 1.96 |
| 30 | 2.88 |
| S · 10Aq + S | |
| 32.48U | 3.50 |
| S | |
| 35 | 3.45 |
| 40 | 3.40 |
| 50 | 3.28 |
| 60 | 3.19 |
| 70 | 3.11 |
| 80 | 3.05 |
| 90 | 3.00 |
| 100* | 2.97 |
| 110 | 2.96 |
| 120 | 2.95 |
| 130 | 2.95 |
| 140 | 2.96 |
| 160 | 3.01 |
| 180 | 3.09 |
| 200 | 3.18 |
| 220 | 3.26 |
| 240 | 3.36 |
| S · 7Aq | |
| 0m | 1.34 |
| 10m | 2.14 |
| 20m | 2.94 |
| S · 7Aq + S | |
| 28.2mU | 3.59 |
| S · 7Aq + S · 10Aq | |
| 34.4mU | 4.08 |

* Above 100° accuracy is unknown. According to (418) $\log M = (-0.49050 + 0.0296389t + 0.0000688925t^2) \pm 0.03\%$. $t$ = Hydrogen temp. scale. Weights *in vacuo*.

**$Na_2S_2O_3$** (274, 486, 533, 534)

(*See* Fig. 19)

| *t*, °C | M |
|---|---|
| S · 6Aq | |
| 0m | 5.41 |
| 5m | 5.94 |
| 10m | 6.75 |
| 13m | 7.72 |
| S · 5Aq(α) | |
| 0 | 3.20 |
| 10 | 3.77 |
| 20 | 4.43 |
| 30 | 5.24 |
| 40 | 6.50 |
| 45 | 7.70 |
| S · 5Aq(β) | |
| 0m | 4.57 |
| 10m | 5.20 |
| 20m | 6.14 |
| 30m | 8.22 |
| S · 4Aq | |
| 31.5mU | 8.50 |
| 35m | 9.30 |
| 38m | 10.40 |
| 40m | 11.4 |

**$Na_2S_2O_3$.**—(*Continued*)

| *t*, °C | M |
|---|---|
| S · 2Aq(α) | |
| 0m | 7.10 |
| 10m | 7.37 |
| 20m | 7.78 |
| 30m | 8.40 |
| 40m | 9.20 |
| 50 | 10.39 |
| 60 | 12.14 |
| 65 | 13.45 |
| S · 2Aq(β) | |
| 0m | 8.60 |
| 10m | 9.08 |
| 20m | 9.90 |
| 30m | 11.13 |
| 35m | 11.88 |
| S · ⅗Aq | |
| 0m | 8.53 |
| 10m | 8.83 |
| 20m | 9.24 |
| 30m | 9.79 |
| 40m | 10.58 |
| 47.5m | 11.58 |
| S · ⅘Aq | |
| 0m | 8.60 |
| 10m | 8.92 |
| 20m | 9.31 |
| 30m | 9.90 |
| 40m | 10.77 |
| 50m | 12.00 |
| 55m | 12.88 |
| S · Aq(α) | |
| 0m | 9.68 |
| 10m | 9.91 |
| 20m | 10.36 |
| 30m | 11.02 |
| 40m | 11.81 |
| 50m | 12.77 |
| 55m | 13.37 |
| S · Aq(β) | |
| 47.5m | 11.63 |
| 50m | 11.90 |
| 55m | 12.54 |
| 60m | 13.48 |
| S · Aq(γ) | |
| 30m | 10.93 |
| 40m | 11.62 |
| 50m | 12.60 |
| 55m | 13.18 |
| S · ½Aq | |
| 30m | 11.47 |
| 40m | 11.77 |
| 50m | 12.28 |
| 60m | 13.07 |
| 70U | 14.10 |
| S | |
| 40m | 13.06 |
| 50m | 13.38 |
| 60m | 13.72 |
| 70 | 14.12 |
| 80 | 14.60 |
| S · 5Aq(β) + S · 4Aq | |
| 30.2mU | 8.3 |
| S · 4Aq + S · 2Aq(α) | |
| 31.5mU | 8.5 |

**$Na_2S_2O_3$.**—(*Continued*)

| *t*, °C | M |
|---|---|
| S · 5Aq(β) + S · 2Aq(α) | |
| 30.5mU | 8.4 |
| S · 5Aq(α) + S · 2Aq(α) | |
| 48.2U | 10.1 |
| S · 4Aq + S · Aq(α) | |
| 40.7mU | 11.9 |
| S · 5Aq(α) | |
| **48.5m** | |
| S · 4Aq | |
| **41.7m** | |
| S · 6Aq | |
| **14.4m** | |

Distinction between Aq(α) and Aq(β) and between ⅗Aq and ⅘Aq, doubtful.

**$Na_2S_2O_4$** (251)

| *t*, °C | M ± 5% |
|---|---|
| 20 | 1.26 |

**$Na_2S_2O_5$** (158); Pyrosulfite

| *t*, °C | M ± 1% |
|---|---|
| S · 7Aq | |
| −10 | 1.59 |
| − 8 | 1.69 |
| − 6 | 1.81 |
| − 2 | 2.16 |
| 0 | 2.38 |
| + 2 | 2.63 |
| S · 6Aq | |
| −10m | 1.64 |
| − 8m | 1.76 |
| − 6m | 1.90 |
| − 4m | 2.09 |
| − 2m | 2.31 |
| 0m | 2.58 |
| + 2m | 2.90 |
| S · 6Aq + S | |
| 4.0U(m?) | 3.02 |
| S | |
| 0m | 3.18 |
| 20 | 3.41 |
| 40 | 3.75 |
| 60 | 4.18 |
| 80 | 4.65 |
| 100 | 5.17 |

**$Na_2S_2O_6$** (11)

| *t*, °C | M ± 5% |
|---|---|
| S · 2Aq | |
| 0 | 0.31 |
| 10 | 0.53 |
| 20 | 0.76 |
| 30 | 1.01 |

**$Na_2SeO_4$** (175)

| *t*, °C | M ± 3% |
|---|---|
| S · 10Aq | |
| 0 | 0.70 |
| 10 | 1.34 |
| 15 | 1.77 |
| 20 | 2.30 |
| 25 | 3.04 |
| 30 | 4.16 |
| S · 10Aq + S | |
| 31U | 4.47 |

**$Na_2SeO_4$.**—(*Continued*)

| $t$, °C | M ± 3% |
|---|---|
| S | |
| 40 | 4.35 |
| 60 | 4.10 |
| 80 | 3.93 |
| 100 | 3.86 |

**$NaNO_2$** (379)

| S | |
|---|---|
| −10 | 9.86 |
| 0 | 10.48 |
| +20 | 11.98 |
| 40 | 13.86 |
| 60 | 16.50 |
| 80 | 19.68 |
| 100 | 23.5 |
| 120 | 29.1 |
| 130 | 32.4 |

**$NaNO_3$** (36, 46, 63, 104, 106, 151, 186, 200, 247, 274, 311, 363, 426, 447, 485)

| $t$, °C | M ± 2% |
|---|---|
| S | |
| −17.5 | 7.4 |
| −10 | 7.90 |
| 0 | 8.62 |
| +10 | 9.43 |
| 20 | 10.31 |
| 25 | 10.80 |
| 30 | 11.31 |
| 40 | 12.39 |
| 50 | 13.50 |
| 60 | 14.70 |
| 70 | 16.02 |
| 80 | 17.42 |
| 90 | 18.96 |
| 100 | 20.64 |
| 110 | 22.56 |
| 120 | 24.80 |

**$NaNH_4SO_4$** (114)

| $t$, °C | M |
|---|---|
| S · 2Aq | |
| 25 | 4.62 |
| 35 | 5.22 |

**$Na_3PO_4$** (111, 399, 410, 448)

| $t$, °C | M ± 5% |
|---|---|
| S · 12Aq | |
| 0 | 0.095 |
| 10 | 0.28 |
| 20 | 0.68 |
| 40 | 1.84 |
| 60 | 3.33 |
| 70 | 4.13 |
| S · 12Aq + S · $x$Aq | |
| 73.4* | |
| S · $x$Aq | |
| 75 | 4.54 |
| 80 | 4.96 |
| 100 | 6.67 |

* This transition found by [410] is not given on curve of [399].

**$Na_4P_2O_7$** (399)

| S · 10Aq | |
|---|---|
| 0 | 0.118 |
| 10 | 0.150 |

**$Na_4P_2O_7$.**—(*Continued*)

| $t$, °C | M ± 5% |
|---|---|
| S · 10Aq | |
| 20 | 0.240 |
| 40 | 0.500 |
| 60 | 0.806 |
| 80 | 1.146 |
| 100 | 1.514 |

**$NaH_2PO_4$** (111, 242)

| $t$, °C | M ± 0.5% |
|---|---|
| S · 2Aq | |
| 0 | 4.82 |
| 5 | 5.11 |
| 10 | 5.82 |
| 15 | 6.39 |
| 20 | 7.07 |
| 25 | 7.89 |
| 30 | 8.85 |
| 35 | 10.03 |
| 40 | 11.52 |
| S · 2Aq + S · Aq | |
| 40.8U | 11.85 |
| S · Aq | |
| 45 | 12.39 |
| 50 | 13.23 |
| 55 | 14.24 |
| S · Aq + S | |
| 57.4U | 14.72 |
| S | |
| 60 | 14.94 |
| 70 | 15.87 |
| 80 | 17.23 |
| 90 | 18.80 |
| 100 | 20.74 |

**$Na_2HPO_4$** (30, 111, 204, 321, 374, 447, 462, 494)

| $t$, °C | M ± 2% |
|---|---|
| S · 12Aq($\beta$) | |
| 0 | 0.116 |
| 5 | 0.174 |
| 10 | 0.254 |
| 15 | 0.336 |
| 20 | 0.550 |
| 25 | 0.86 |
| S · 12Aq($\beta$) + S · 12Aq ($\alpha$) | |
| 29.8U | 1.67 |
| S · 12Aq($\alpha$) | |
| 30 | 1.69 |
| 32 | 1.94 |
| 34 | 2.44 |
| S · 12Aq($\alpha$) + S · 7Aq | |
| 35.1U | 3.00 |
| S · 7Aq | |
| 36 | 3.16 |
| 40 | 3.81 |
| 44 | 4.60 |
| 48 | 5.59 |
| S · 7Aq + S · 2Aq | |
| 48.1U | 5.64 |
| S · 2Aq | |
| 50 | 5.66 |
| 60 | 5.82 |
| 70 | 6.16 |
| 80 | 6.61 |
| 90 | 7.24 |

**$Na_2HPO_4$.**—(*Continued*)

| $t$, °C | M ± 2% |
|---|---|
| S · 2Aq + S | |
| 95U | 7.60 |
| S | |
| 97.5 | 7.35 |
| 100 | 7.10 |

**$Na_3AsO_4$** (448)

| $t$, °C | M |
|---|---|
| 14 | 0.56 |

**$Na_2HAsO_4$** (448, 494)

| S · 12Aq | |
|---|---|
| 0 | 0.39 ± 5% |
| 5 | 0.55 ± 5% |
| 10 | 0.79 ± 5% |
| 15 | 1.15 ± 5% |
| 20 | 1.77 ± 5% |
| 28 | 4.63 ± 5% |

**$NaH_2SbO_4$** (499)

| S · 2Aq | |
|---|---|
| 20 | 0.00248 |
| 25 | 0.00299 |
| 30 | 0.00360 |
| 35 | 0.00443 |

**$Na_3SbS_4$** (127)

| S · 9Aq | |
|---|---|
| 0 | 0.419 |
| 10 | 0.640 |
| 20 | 0.884 |
| 30 | 1.18 |
| 40 | 1.55 |
| 50 | 2.00 |
| 60 | 2.56 |
| 70 | 3.25 |
| 80 | 4.24 |

**$Na_2CO_3$** (45, 90, 106, 143, 171, 201, 256, 300, 307, 338, 339, 375, 447, 519) (*See* Fig. 20)

| S · 10Aq | |
|---|---|
| 0 | 0.66 |
| 5 | 0.84 |
| 10 | 1.14 |
| 15 | 1.55 |
| 20 | 2.09 |
| 25 | 2.77 |
| 28 | 3.27 |
| 30 | 3.70 |
| S · 10Aq + S · 7Aq($\beta$) | |
| 32.00U | 4.29 |
| S · 10Aq + S · Aq | |
| 32.96mU | 4.72 |
| S · 7Aq($\beta$) | |
| 0m | 1.92 |
| 10m | 2.48 |
| 20m | 3.16 |
| 30m | 4.07 |
| 32 | 4.29 |
| 34 | 4.51 |
| 36m | 4.77 |
| S · 7Aq($\beta$) + S · Aq | |
| 35.37U | 4.69 |
| S · 7Aq($\alpha$) | |
| 0m | 3.01 |
| 5m | 3.28 |
| 10m | 3.58 |

**$Na_2CO_3$.**—(*Continued*)

| $t$, °C | M |
|---|---|
| S · 7Aq($\alpha$) | |
| 15m | 3.91 |
| 20m | 4.32 |
| S · Aq | |
| 30m | 4.77 |
| 40 | 4.61 |
| 50 | 4.48 |
| 60 | 4.38 |
| 80 | 4.28 |
| 100 | 4.26 |

**$Na_2C_2O_4$** (102, 103, 165, 400, 473); Oxalate

| S | |
|---|---|
| ↓ 15 | 0.237 ± 3% |
| ↓ 100 | 0.472 ± 3% |

**$NaHCO_2$** (194)

Formate

| $t$, °C | M ± 2% |
|---|---|
| S · 3Aq | |
| −20 | 4.34 |
| −10 | 5.10 |
| 0 | 6.44 |
| + 5 | 7.50 |
| 10 | 8.90 |
| 15 | 10.71 |
| 18m | 11.99 |
| S · 3Aq + S · 2Aq | |
| 17.0U | 11.6 |
| S · 2Aq | |
| 18 | 11.88 |
| 20 | 12.52 |
| 23 | 13.68 |
| 26m | 15.3 |
| S · Aq + S | |
| 24.8U | 14.5 |
| S | |
| 20m | 14.3 |
| 30 | 15.1 |
| 60 | 17.8 |
| 80 | 20.1 |
| 100 | 23.5 |
| 120 | 27.9 |

**$NaHCO_3$** (122, 149, 151, 171, 307, 500, 501)

| $t$, °C | M ± 1% |
|---|---|
| S | |
| 0 | 0.82 |
| 15 | 1.05 |
| 25 | 1.22 |
| 30 | 1.31 |
| 35 | 1.41 |
| 45 | 1.62 |
| 60 | 1.96 |

**$NaCH_3CO_2$** (193, 222, 445)

Acetate

| $t$, °C | M |
|---|---|
| S · 3Aq | |
| 0 | 4.56 |
| 10 | 4.98 |
| 20 | 5.60 |
| 30 | 6.54 |
| 40 | 7.92 |

**$NaCH_3CO_2$.—(*Continued*)**

| *t*, °C | M |
|---|---|
| S · 3Aq | |
| 50 | 10.20 |
| 55 | 12.20 |
| 58m | 18.50 |
| S · 3Aq + S | |
| 58U | 16.80 |
| S | |
| 0m | 14.51 |
| 20m | 15.11 |
| 40m | 15.87 |
| 60 | 17.02 |
| 80 | 18.63 |
| 100 | 20.75 |
| 120 | 23.17 |

**$Na_2C_4H_4O_8$ (152)**
Dihydroxytartrate

| | |
|---|---|
| 0 | 0.00173 |

**$NaC_6H_5CO_2$ (463)**
Benzoate

| | |
|---|---|
| S | |
| 0 | 4.36 |
| 50 | 4.40 |
| 75 | 4.68 |
| 100 | 5.15 |
| 125 | 5.92 |
| 150 | 7.08 |
| 175 | 8.50 |
| 200 | 10.20 |

**$NaC_6H_4OHCO_2$ (463)**
*o*-Hydroxybenzoate

| *t*, °C | M ± 3 % |
|---|---|
| S · 6Aq | |
| 0 | 1.69 |
| 5 | 2.15 |
| 10 | 2.82 |
| 15 | 3.96 |
| S · 6Aq + S | |
| 20.0U | 6.45 |
| S | |
| 30 | 6.88 |
| 50 | 7.75 |
| 70 | 8.68 |
| 90 | 9.72 |
| 100 | 10.30 |
| 120 | 11.65 |
| 130 | 12.50 |

**$NaC_6H_4OHCO_2$ (463)**
*m*-Hydroxybenzoate

| | |
|---|---|
| S | |
| 10 | 8.88 |
| 20 | 9.03 |
| 30 | 9.21 |
| 50 | 9.69 |
| 75 | 10.5 |
| 100 | 11.62 |
| 125 | 12.97 |
| 150 | 14.53 |

**$NaC_6H_4OHCO_2$ (463)**
*p*-Hydroxybenzoate

| *t*, °C | M ± 4% |
|---|---|
| S · 5Aq | |
| 0 | 1.10 |

**$NaC_6H_4OHCO_2$.—(*Continued*)**

| *t*, °C | M ± 4% |
|---|---|
| S · 5Aq | |
| 10 | 1.75 |
| 20 | 2.50 |
| 30 | 3.47 |
| S · 5Aq + S | |
| 38U | 4.8 |
| S | |
| 50 | 5.10 |
| 150 | 7.30 |

**$NaC_6H_4NO_2O$ (156, 189)**
*p*-Nitrophenate

| *t*, °C | M ± 0.5% |
|---|---|
| S · 4Aq | |
| 20 | 3.00 |
| 25 | 3.67 |
| 30 | 4.40 |
| S · 4Aq + S · 2Aq | |
| 35.4U | 5.38 |
| S · 2Aq | |
| 40 | 6.10 |
| 45 | 6.93 |
| 50 | 7.88 |

**$NaC_6H_3(NO_2)_2O$ (156)**
3, 4-Dinitrophenate

| *t*, °C | M |
|---|---|
| S · Aq | |
| 25 | 0.219 |

**$NaC_6H_2(NO_2)_3O$ (156)**
Picrate

| *t*, °C | M |
|---|---|
| S · Aq | |
| 0 | 0.073 |
| 25 | 0.173 |

**$NaC_6H_3ClNO_2O$ (156)**
3, 4-Chloronitrophenate

| | |
|---|---|
| S · Aq | |
| 25 | 0.139 |

**$NaHC_{10}H_5NH_2(SO_3)_2$**
**$Na_2C_{10}H_5NH_2(SO_3)_2$**
Naphthylaminedisulfonates
*v.* p. 219

**$NaClNO_2C_6H_2CH_2SO_3$ (113)**
Chloronitro-*m*-toluenesulfonate

| *t*, °C | M ± 4% |
|---|---|
| 0 | 0.380 |
| 10 | 0.426 |
| 15 | 0.470 |
| 20 | 0.533 |
| 25 | 0.618 |
| 30 | 0.740 |

**$Na_2ZrF_6$ (308)**

| *t*, °C | M |
|---|---|
| 18 | 0.0151 |
| 100 | 0.0665 |

**$Na_2SnO_3$ (535)**

| | |
|---|---|
| S · 4Aq | |
| − 5 | 2.53 |
| 0 | 2.60 |
| +10 | 2.74 |
| 20 | 2.89 |
| 30 | 3.08 |

**$Na_2SnO_3$.—(*Continued*)**

| *t*, °C | M |
|---|---|
| S · 4Aq | |
| 40 | 3.30 |
| 50 | 3.62 |
| S · 3Aq + S · 4Aq | |
| − 9U | 2.47 |
| S · 3Aq | |
| − 5 | 2.46 |
| 0 | 2.44 |
| +10 | 2.40 |
| 20 | 2.32 |
| 30 | 2.21 |
| 40 | 2.05 |
| 45 | 1.91 |

**$Na_2SO_4.ZnSO_4$ (266)**

| *t*, °C | M ± 1% |
|---|---|
| S · 4Aq | |
| 25 | 1.637 |
| 30 | 1.641 |
| 35 | 1.646 |
| 40 | 1.654 |

**$Na_2SO_4.CdSO_4$ (266)**

| | |
|---|---|
| S · 4Aq | |
| 25 | 1.72 |
| 30 | 1.74 |
| 35 | 1.77 |
| 40 | 1.79 |

**$Na_2SO_4.CuSO_4$ (266, 311)**

| | |
|---|---|
| S · 2Aq | |
| 20 | 1.24 |
| 25 | 1.22 |
| 30 | 1.20 |
| 35 | 1.18 |
| 40 | 1.17 |

**$NaAuCl_4$ (429)**

| *t*, °C | M ± 3% |
|---|---|
| S · 2Aq | |
| 10 | 3.95 |
| 20 | 4.18 |
| 30 | 4.91 |
| 40 | 6.26 |
| 50 | 9.52 |
| 60 | 24.9 |

**$Na_2SO_4.FeSO_4$ (266)**

| *t*, °C | M ± 1% |
|---|---|
| S · 4Aq | |
| 20 | 1.59 |
| 25 | 1.55 |
| 30 | 1.53 |
| 35 | 1.55 |
| 40 | 1.59 |

**$Na_4Fe(CN)_6$ (210)**

| *t*, °C | M ± 0.2% |
|---|---|
| 25 | 0.682 |

**$Na_2SO_4.CoSO_4$ (266)**

| *t*, °C | M ± 1% |
|---|---|
| S · 4Aq | |
| 20 | 1.73 |
| 25 | 1.62 |
| 30 | 1.52 |
| 35 | 1.44 |
| 40 | 1.39 |

**$Na_2SO_4.NiSO_4$ (266)**

| | |
|---|---|
| S · 4Aq | |
| 20 | 1.89 |

**$Na_2SO_4.NiSO_4$.—(*Continued*)**

| *t*, °C | M ± 1% |
|---|---|
| S · 4Aq | |
| 25 | 1.74 |
| 30 | 1.60 |
| 35 | 1.49 |
| 40 | 1.43 |

**$Na_2CrO_4$ (357, 358, 378, 412, 440, 449, 483)**

| *t*, °C | M ± 2% |
|---|---|
| S · 10Aq | |
| 0 | 1.96 |
| 5 | 2.50 |
| 10 | 3.10 |
| 15 | 3.80 |
| 20m | 5.00 |
| 21m | 5.56 |
| S · 6Aq + S · 10Aq | |
| 19.6U | 4.88 |
| S · 10Aq + S · 4Aq | |
| 20.1mU | 5.05 |
| S · 6Aq | |
| 18m | 4.80 |
| 20 | 4.91 |
| 22 | 5.02 |
| 24 | 5.13 |
| S · 4Aq | |
| 20m | 5.04 |
| 30 | 5.39 |
| 40 | 5.92 |
| 50 | 6.48 |
| 60 | 7.14 |
| S · 4Aq + S | |
| 64.8U | 7.58 |
| S | |
| 70 | 7.61 |
| 80 | 7.68 |
| 90 | 7.74 |
| 100 | 7.80 |
| S · 6Aq + S · 4Aq | |
| 26.0U | 5.24 |

**$Na_2Cr_2O_7$ (358, 449)**

| *t*, °C | M ± 2% |
|---|---|
| S · 2Aq | |
| 0 | 6.22 |
| 10 | 6.50 |
| 20 | 6.90 |
| 30 | 7.51 |
| 40 | 8.40 |
| 60 | 10.64 |
| 80 | 14.76 |
| S · 2Aq + S | |
| 84U | 16.40 |
| S | |
| 90 | 16.44 |
| 100 | 16.60 |

**$Na_2Cr_3O_{10}$ (358)**

| *t*, °C | M ± 3% |
|---|---|
| S · Aq | |
| 0 | 11.1 |
| 20 | 11.5 |
| 40 | 12.3 |
| 60 | 13.5 |
| 80 | 15.0 |
| 100 | 16.8 |

**$Na_2Cr_4O_{13}$ (358)**

| $t$, °C | M ± 3% |
|---|---|
| S · 4Aq | |
| 0 | 5.84 |
| 10 | 5.97 |
| 15 | 6.16 |
| 22 | 6.86 |

**$Na_4CrO_5$ (358)**

| S · 13Aq | |
|---|---|
| 0 | 2.19 |
| 10 | 2.47 |
| 20 | 2.71 |
| 25 | 2.88 |
| 30 | 3.12 |
| 37 | 3.68 |

**$Na_2MoO_4$ (175)**

| S · 10Aq | |
|---|---|
| 0 | 2.14 |
| 2 | 2.30 |
| 4 | 2.48 |
| 6 | 2.68 |
| 8 | 2.88 |
| 10 | 3.10 |
| S · 10Aq + S · 2Aq | |
| 10.4U | 3.14 |
| S · 2Aq | |
| 20 | 3.16 |
| 40 | 3.28 |
| 60 | 3.50 |
| 80 | 3.76 |
| 100 | 4.06 |

**$Na_2WO_4$ (175)**

| $t$, °C | M ± 2% |
|---|---|
| S · 10Aq | |
| − 4 | 1.60 |
| − 2 | 1.79 |
| 0 | 1.96 |
| S · 10Aq + S · 2Aq | |
| + 6U | 2.44 |
| S · 2Aq | |
| 0m | 2.43 |
| 10 | 2.45 |
| 20 | 2.49 |
| 40 | 2.63 |
| 60 | 2.83 |
| 80 | 3.06 |
| 100 | 3.32 |

**$Na_2B_4O_7$ (239, 374, 441)**

| S · 10Aq | |
|---|---|
| 0 | 0.055 |
| 10 | 0.081 |
| 20 | 0.129 |
| 30 | 0.199 |
| 40 | 0.312 |
| 45 | 0.400 |
| 50 | 0.524 |
| 55 | 0.706 |
| 60 | 0.964 |
| S · 10Aq + S · 5Aq | |
| 61U | 1.018 |
| S · 5Aq | |
| 65 | 1.088 |
| 70 | 1.212 |
| 75 | 1.36 |

**$Na_2B_4O_7$.—(*Continued*)**

| $t$, °C | M ± 2% |
|---|---|
| S · 5Aq | |
| 80 | 1.56 |
| 90 | 2.03 |
| 100 | 2.60 |

**$NaAl(SO_4)_2$ (466)**

| $t$, °C | M ± 0.5% |
|---|---|
| S · 12Aq | |
| 10 | 1.516 |
| 15 | 1.599 |
| 20 | 1.688 |
| 25 | 1.783 |
| 30 | 1.892 |

**$Na_2SO_4.MgSO_4$ (16)**

| $t$, °C | M ± 2% |
|---|---|
| S · 4Aq | |
| 25 | 1.97 |
| 30 | 2.00 |
| 35 | 2.07 |
| 47 | 2.00 |

**KOH (133, 153, 167, 393, 449, 513)**

| $t$, °C | M ± 2% |
|---|---|
| S · 4Aq | |
| −45 | 10.2 |
| −40 | 11.0 |
| −35 | 12.2 |
| **−32.8** | 13.9 |
| S · 4Aq + S · 2Aq | |
| −33.0E | 14.44 |
| S · 2Aq* | |
| −20 | 15.4 |
| 0 | 17.3 |
| +10 | 18.4 |
| 20 | 19.9 |
| 30 | 22.5 |
| S · 2Aq + S · Aq | |
| 33U | 24.00 |
| S · Aq | |
| 40 | 24.4 |
| 60 | 26.0 |
| 80 | 28.4 |
| 100 | 31.6 |
| 120 | 36.2 |
| 140 | 45.6 |

* The values of (167, 449) at 15° and 25° are 5–10 % lower.

**KF (125, 357)**

| $t$, °C | M |
|---|---|
| S · 2Aq | |
| 18 | 15.9 |
| 21 | 16.6 |

**KCl (4, 5, 8, 22, 36, 43, 45, 46, 63, 70, 105, 106, 139, 173, 200, 222, 224, 233, 324, 373, 426, 447, 481, 495, 502, 513); *cf.* (540)**

| $t$, °C | M ± 0.5% |
|---|---|
| S | |
| −10 | 3.33 |
| 0 | 3.76 |
| +10 | 4.19 |
| 20 | 4.61 |
| 25 | 4.81 |
| 30 | 5.01 |

**KCl.—(*Continued*)**

| $t$, °C | M ± 0.5% |
|---|---|
| S | |
| 40 | 5.40 |
| 60 | 6.15 |
| 80 | 6.83 |
| 100 | 7.51 |
| $t$, °C | M ± 5% |
| 120 | 8.2 |
| 140 | 8.9 |
| 160 | 9.6 |
| 180 | 10.3 |

**$KClO_3$ (19, 63, 76, 80, 84, 144, 181, 199, 363, 485, 495, 498)**

| $t$, °C | M ± 3% |
|---|---|
| S | |
| 0 | 0.270 |
| 10 | 0.400 |
| 20 | 0.582 |
| 30 | 0.828 |
| 40 | 1.156 |
| 60 | 2.02 |
| 80 | 3.13 |
| 100 | 4.61 |
| 120 | 6.50 |
| 140 | 8.52 |

**$KClO_4$ (76, 80, 157, 343, 367, 370, 436, 493)**

| S | |
|---|---|
| 0 | 0.052 |
| 10 | 0.078 |
| 20 | 0.121 |
| 25 | 0.149 |
| 30 | 0.182 |
| 40 | 0.268 |
| 50 | 0.376 |
| 60 | 0.568 |
| 80 | 1.04 |
| 100 | 1.56 |

**KBr (4, 63, 105, 144, 200, 202, 254, 324, 426, 485, 495); *cf.* (540)**

| $t$, °C | M ± 1% |
|---|---|
| S | |
| −10 | 3.98 |
| 0 | 4.49 |
| +10 | 4.97 |
| 20 | 5.42 |
| 30 | 5.88 |
| ↓ 40 | 6.31 |
| ↓ 100 | 8.84 |
| $t$, °C | M ± 5% |
| 110 | 9.2 |
| 120 | 9.7 |
| 140 | 10.5 |
| 160 | 11.3 |
| 180 | 12.1 |

**$KBrO_3$ (178, 277, 436)**

| $t$, °C | M ± 5% |
|---|---|
| S | |
| 0 | 0.186 |
| 20 | 0.426 |
| 40 | 0.86 |
| 60 | 1.32 |
| 80 | 2.01 |

**KI (4, 63, 105, 118, 144, 181, 200, 272, 324, 383, 495, 515); *cf.* (540)**

| $t$, °C | M ± 2% |
|---|---|
| S | |
| −20 | 6.72 |
| −10 | 7.23 |
| 0 | 7.72 |
| +10 | 8.18 |
| 20 | 8.63 |
| 30 | 9.10 |
| ↓ 40 | 9.55 |
| ↓ 100* | 12.5 |
| 120 | 13.7 |
| 140 | 15.3 |
| 160 | 17.2 |
| 180 | 19.2 |

* Above 100° less accuracy.

**$KIO_3$ (277, 316)**

| S | |
|---|---|
| 0 | 0.220 |
| 20 | 0.380 |
| 30 | 0.491 |
| 40 | 0.604 |
| 60 | 0.870 |
| 80 | 1.16 |

**$KIO_4$ (23)**

| $t$, °C | M |
|---|---|
| S | |
| 13 | 0.0287 |

**$K_2SO_3$ (158)**

| $t$, °C | M ± 1% |
|---|---|
| S | |
| −30 | 6.60 |
| −20 | 6.62 |
| 0 | 6.68 |
| +20 | 6.74 |
| 40 | 6.81 |
| 60 | 6.89 |
| 80 | 7.00 |
| 100 | 7.14 |

**$K_2SO_4$ (5, 36, 43, 45, 59, 63, 70, 81, 144, 200, 217, 222, 287, 311, 318, 374, 467, 495, 504, 522)**

| S | |
|---|---|
| 0 | 0.423 |
| 10 | 0.530 |
| 20 | 0.637 |
| 25 | 0.690 |
| 30 | 0.742 |
| 40 | 0.848 |
| 60 | 1.041 |
| 80 | 1.220 |
| 100 | 1.382 |
| 120 | 1.52 ± 3% |
| 140 | 1.65 ± 3% |
| 160 | 1.77 ± 3% |
| 180 | 1.89 ± 3% |

**$K_2S_2O_3$ (252)**

| S · 2Aq | |
|---|---|
| 0 | 5.05 |
| S · ⅔Aq | |
| 20 | 8.20 |

$K_2S_2O_3$.—(*Continued*)

| *t*, °C | M ± 1% |
|---|---|
| S · ⅝Aq | |
| 25 | 8.67 |
| 30 | 9.26 |
| S · ⅝Aq + S · Aq | |
| 35U | 10.64 |
| S · Aq | |
| 40 | 10.76 |
| 50 | 11.30 |
| 55 | 11.91 |
| S · Aq + S · ⅓Aq | |
| 56.1U | 12.32 |
| S · ⅓Aq | |
| 60 | 12.52 |
| 70 | 13.41 |
| 75 | 14.11 |
| S · ⅓Aq + S | |
| 78.3U | 15.34 |
| S | |
| 80 | 15.40 |
| 85 | 15.68 |
| 90 | 16.38 |

$K_2S_2O_5$ (158)

| *t*, °C | M ± 2% |
|---|---|
| S | |
| − 5m | 1.10 |
| 0m | 1.28 |
| +10 | 1.61 |
| 20 | 2.01 |
| 30 | 2.43 |
| ↓ 80 | 4.81 |
| 90 | 5.32 |
| 100 | 5.83 |
| S · ⅔Aq + S | |
| 3U | 1.39 |
| S · ⅔Aq | |
| 0 | 1.26 |
| 5m | 1.48 |
| 10m | 1.69 |
| 15m | 1.93 |
| 20m | 2.19 |

$K_2S_2O_6$ (11)

| S | |
|---|---|
| 0 | 0.108 |
| 10 | 0.172 |
| 20 | 0.270 |
| 30 | 0.392 |

$K_2SeO_4$ (144, 506)

| *t*, °C | M ± 5% |
|---|---|
| S | |
| −20 | 4.76 |
| 0 | 4.88 |
| ↓ +20 | 5.00 |
| ↓ 100 | 5.51 |

$K_2TeO_4$ (433)

| *t*, °C | M |
|---|---|
| S | |
| 0 | 0.327 |
| 10 | 0.636 |
| 20 | 1.020 |
| 30 | 1.867 |

$KNO_2$ (379)

| *t*, °C | M ± 3% |
|---|---|
| S | |
| −10 | 31.6 |
| 0 | 32.9 |
| +20 | 35.5 |
| ↓ 40 | 38.4 |
| ↓ 120 | 51.4 |

$KNO_3$ (5, 22, 36, 46, 63, 84, 106, 145, 155, 181, 186, 200, 202, 311, 447, 495, 498)

| *t*, °C | M ± 2% |
|---|---|
| S | |
| 0 | 1.30 |
| 10 | 2.08 |
| 20 | 3.08 |
| 25 | 3.74 |
| 30 | 4.47 |
| 40 | 6.22 |
| 50 | 8.42 |
| 60 | 10.89 |
| 70 | 13.72 |
| 80 | 16.78 |
| 90 | 20.40 |
| 100 | 24.50 |
| 110 | 29.00 |

$KNO_3.2HNO_3$ (196)

| *t*, °C | *x* |
|---|---|
| S | |
| 0 | 0.530 |
| 4 | 0.577 |
| 8 | 0.631 |
| 12 | 0.692 |
| 16 | 0.770 |
| 20 | 0.880 |
| **22** | 1.000 |

$K_3PO_4$ (111)

| *t*, °C | M |
|---|---|
| 25 | 9.1 |

$KH_2PO_4$ (111, 352)

| S | |
|---|---|
| 7 | 2.01 |
| 25 | 2.21 |

$K_3SbS_4$ (127)

| S · 6Aq | |
|---|---|
| −34 | 4.44 |
| −10 | 5.17 |
| − 5 | 6.08 |
| S · 5Aq | |
| 0 | 8.3 |
| +10 | 8.7 |
| 15 | 8.4 |
| 30 | 8.2 |
| S · 3Aq | |
| 50 | 9.5 |
| 80 | 10.4 |

$K_2CO_3$ (45, 166, 346, 375, 513)

| S · *x*Aq | |
|---|---|
| 0 | 6.46 |
| 5 | 7.52 |
| S · *x*Aq + S · 2Aq | |
| 7(?) | 7.88(?) |
| S · 2Aq | |
| 10 | 7.9 |
| 20 | 8.0 |

$K_2CO_3$.—(*Continued*)

| *t*, °C | M |
|---|---|
| S · 2Aq | |
| 30 | 8.2 |
| 40 | 8.4 |
| 50 | 8.8 |
| 60 | 9.2 |
| 70 | 9.6 |
| 80 | 10.1 |
| 90 | 10.6 |
| 100 | 11.3 |

$K_2C_2O_4$ (102, 165, 214, 265)
Oxalate

| *t*, °C | M ± 3% |
|---|---|
| S · Aq | |
| 0 | 1.56 |
| 10 | 1.82 |
| 20 | 2.09 |
| 30 | 2.36 |
| ↓ 40 | 2.64 |
| ↓ 80 | 3.82 |
| 90 | 4.16 |
| 100 | 4.52 |

For more extensive data, *v.* (538)

$KHCO_2$ (194)
Formate

| *t*, °C | *x* |
|---|---|
| −20 | 0.365 |
| 0 | 0.390 |
| +20 | 0.420 |
| 40 | 0.456 |
| 60 | 0.500 |
| 80 | 0.555 |
| 100 | 0.621 |
| 120 | 0.711 |
| 140 | 0.836 |
| 157 | 1.000 |

$KHCO_3$ (122)

| *t*, °C | M ± 10% |
|---|---|
| S | |
| 0 | 2.24 |
| 10 | 2.77 |
| 20 | 3.32 |
| ↓ 30 | 3.89 |
| ↓ 60 | 6.00 |

$KHC_2O_4$ (265)
Oxalate

| *t*, °C | M ± 2% |
|---|---|
| S | |
| 50 | 1.12 |
| 60 | 1.54 |
| 70 | 2.00 |
| 80 | 2.48 |
| 90 | 3.03 |
| 100 | 3.76 |

$KCH_3CO_2$ (1)
Acetate

| *t*, °C | M ± 1% |
|---|---|
| S · ⅝Aq | |
| 0 | 22.06 |
| 10 | 23.72 |
| 20 | 25.98 |
| 30 | 29.00 |
| 40 | 32.94 |

$KCH_3CO_2$.—(*Continued*)

| *t*, °C | M ± 1% |
|---|---|
| S · ⅝Aq + S · ½Aq | |
| 41.3U | 33.50 |
| S · ½Aq | |
| 50 | 34.40 |
| 60 | 35.64 |
| 70 | 37.14 |
| 80 | 38.74 |
| 90 | 40.38 |
| 100 | 42.10 |

$KCHO_2.CH_2O_2$ (194)
Formate

| *t*, °C | *x* |
|---|---|
| S | |
| 0 | 0.174 |
| 10 | 0.199 |
| 20 | 0.227 |
| 30 | 0.260 |
| 40 | 0.298 |
| 50 | 0.345 |
| 60 | 0.402 |
| 70 | 0.476 |
| 80 | 0.574 |

$KHC_2O_4.H_2C_2O_4$ (265)
Tetroxalate

| *t*, °C | M ± 5% |
|---|---|
| S · 2Aq | |
| 0 | 0.052 |
| 20 | 0.131 |
| 40 | 0.284 |
| 60 | 0.548 |
| 80 | 1.00 |
| 100 | 3.31 |

$KHC_4H_4O_6$ (3, 64, 368, 388, 427)
Tartrate

| *t*, °C | M ± 2% |
|---|---|
| S | |
| 0 | 0.017 |
| 10 | 0.0215 |
| 20 | 0.0290 |
| 25 | 0.0348 |
| *t*, °C | M ± 10% |
| 30 | 0.043 |
| 40 | 0.065 |
| 50 | 0.092 |
| 60 | 0.128 |
| 80 | 0.240 |
| 100 | 0.375 |

$KHC_4H_4O_6$ (64)
Racemate

| *t*, °C | M ± 2% |
|---|---|
| S | |
| 20 | 0.0268 |
| 22 | 0.0282 |

$K_2C_4H_4O_8$ (152)
Dihydroxytartrate

| *t*, °C | M |
|---|---|
| 0 | 0.105 |

$KHC_4H_4O_8$ (152)
Dihydroxytartrate

| 0 | 0.126 |
|---|---|

**$KC_6H_5CO_2$ (380, 463)**
Benzoate

| $t$, °C | M ± 2% |
|---|---|
| | S |
| 0 | 3.98 |
| 10 | 4.20 |
| 20 | 4.47 |
| ↓ 30 | 4.77 |
| ↓ 80 | 6.49 |
| 100 | 7.28 |
| 120 | 8.20 |
| 140 | 9.28 |
| 160 | 10.51 |
| 180 | 12.08 |

**$KC_7H_5O_3$ (463)**
Salicylate

| $t$, °C | M ± 3% |
|---|---|
| | S · Aq |
| 0 | 4.46 |
| 10 | 5.14 |
| 20 | 6.08 |
| 30 | 7.34 |
| | S · Aq + S |
| 31U | 7.62 |
| | S |
| 40 | 7.94 |
| 60 | 9.00 |
| 80 | 10.4 |
| 100 | 12.3 |
| 120 | 14.6 |
| 140 | 17.1 |

**$KC_7H_5O_3$ (463)**
*m*-Hydroxybenzoate

| | |
|---|---|
| | S |
| 0 | 8.19 |
| 20 | 8.70 |
| 40 | 9.47 |
| 60 | 10.5 |
| 80 | 11.8 |
| 100 | 13.4 |
| 120 | 15.3 |
| 140 | 17.4 |

**$KC_7H_5O_3$ (463)**
*p*-Hydroxybenzoate

| | |
|---|---|
| | S · 3Aq |
| 10 | 2.10 |
| 20 | 2.70 |
| 30 | 3.50 |
| 40 | 4.45 |
| 50 | 5.57 |
| 60 | 6.84 |
| 70 | 8.21 |
| | S · 3Aq + S |
| 79U | 9.51 |
| | S |
| 80 | 9.53 |
| 90 | 9.73 |
| 100 | 9.94 |
| 110 | 10.1 |
| 120 | 10.3 |
| 130 | 10.5 |

**$KHC_6H_4(CO_2)_2$ (218)**
Phthalate

| $t$, °C | M |
|---|---|
| 25 | 0.502 |
| 35 | 0.621 |

**$KC_2H_5SO_4$ (205)**
Ethylsulfate

| $t$, °C | M ± 3% |
|---|---|
| | S(α) + Ice (?) |
| −12.9 | 4.69 |
| | S(α) |
| −10 | 5.16 |
| 0 | 6.78 |
| +10 | 9.04 |
| 20 | 12.1 |
| 30 | 16.0 |
| 40 | 21.0 |
| 50 | 27.1 |
| | S(α) + S(β) |
| 51.8U | 28.4 |
| | S(β) + Ice (?) |
| −15.2m | 5.76 |
| | S(β) |
| −10m | 6.57 |
| 0m | 8.66 |
| +10m | 11.2 |
| ↓ 20m | 14.3 |
| ↓ 50m | 27.4 |
| 60 | 32.8 |
| 70 | 38.2 |
| 80 | 44.3 |
| 90 | 51.1 |

**$K_2(H_6TeO_6C_2O_4)$ (433)**
Oxalotellurate

| $t$, °C | M |
|---|---|
| | S |
| 0 | 0.069 |
| 10 | 0.100 |
| 20 | 0.135 |
| 30 | 0.174 |
| 40 | 0.229 |
| 50 | 0.312 |

**KCN (293)**

| | |
|---|---|
| | S |
| 25 | 11.00 |

**KCNO (293)**

| | |
|---|---|
| | S |
| 25 | 9.25 |

**$KC_6H_2(NO_2)_3O$ (156)**
Picrate

| | |
|---|---|
| | S |
| 25 | 0.0243 |

**KCNS (161, 437)**

| $t$, °C | M ± 3% |
|---|---|
| | S |
| 0 | 18.2 |
| 10 | 19.5 |
| 20 | 22.2 |
| 25 | 24.6 |

**$KHC_{10}H_6NH_2(SO_3)_2$**
**$K_2C_{10}H_5NH_2(SO_3)_2$**
Naphthylaminedisulfonates
*v.* p. 219

**$KClNO_2C_6H_2CH_3SO_3$ (113)**
Chloronitro-*m*-toluene sulfonate

| $t$, °C | M ± 3% |
|---|---|
| 0 | 0.0081 |
| 10 | 0.0097 |
| 20 | 0.0135 |
| 30 | 0.0197 |

**$K_2ZrF_6$ (308, 333)**

| $t$, °C | M ± 5% |
|---|---|
| 10 | 0.0432 |
| 20 | 0.0547 |
| 30 | 0.0679 |
| 40 | 0.0835 |
| 50 | 0.104 |
| 60 | 0.135 |
| 70 | 0.179 |
| 80 | 0.244 |
| 90 | 0.392 |
| 100 | 0.85 |

**$K_2SnO_3$ (535)**

| $t$, °C | M |
|---|---|
| | S · 4Aq |
| 28 | 5.01 |
| | S · 5Aq |
| 28 | 5.35 |

**$K_2SnF_6$ (55)**

| | |
|---|---|
| | S · Aq |
| 18 | 0.104 ± 5% |

**$K_2SnOHF_5$ (55)**

| | |
|---|---|
| | S · Aq |
| 18 | 0.214 ± 5% |

**$K_2SO_4.ZnSO_4$ (299)**

| | |
|---|---|
| | S · 3Aq |
| 25 | 0.393 |

**$KCl.CdCl_2$ (421)**

| | |
|---|---|
| | S · Aq |
| 0 | 1.01 |
| 20 | 1.54 |
| 40 | 2.08 |
| 60 | 2.64 |
| 80 | 3.24 |
| 100 | 3.93 |

**$KBr.CdBr_2$ (422)**

| | |
|---|---|
| | S · Aq |
| 0 | 2.90 |
| 20 | 3.83 |
| 40 | 4.88 |
| 60 | 5.98 |
| 80 | 7.12 |
| 100 | 8.33 |
| 110 | 8.95 |

**$K_2SO_4.CuSO_4$ (81, 299, 318, 504)**

| $t$, °C | M ± 3% |
|---|---|
| | S · 6Aq |
| 25 | 0.341 |
| 30 | 0.390 |
| 40 | 0.517 |
| 50 | 0.681 |
| 60 | 0.887 |

**$KAuCl_4$ (429)**

| | |
|---|---|
| | S · 0.5Aq |
| 10 | 1.01 |
| 20 | 1.63 |

**$KAuCl_4$.**—*(Continued)*

| $t$, °C | M ± 3 % |
|---|---|
| | S · 0.5Aq |
| 30 | 2.51 |
| 40 | 3.84 |
| 50 | 6.17 |
| 60 | 10.7 |

**$K_2IrCl_6$ (185.5)**

**$K_2PtCl_6$ (6)**

| $t$, °C | M ± 2% |
|---|---|
| 0 | 0.0091 |
| 10 | 0.0110 |
| 20 | 0.0153 |
| 30 | 0.0203 |
| 40 | 0.0281 |
| ↓ 60 | 0.0501 |
| ↓ 90 | 0.0897 |

**$K_2Pt(CN)_4$ (491)**

| | |
|---|---|
| | S · 5Aq |
| 0 | 0.307 |
| 5 | 0.376 |
| 10 | 0.536 |
| | S · 5Aq + S · 3Aq |
| 14.4U | 0.703 |
| | S · 3Aq |
| 15 | 0.720 |
| 20 | 0.890 |
| 30 | 1.400 |
| 40 | 2.080 |
| 50 | 2.87 |
| | S · 3Aq + S · 2Aq |
| 52.8U | 3.22 |
| | S · 2Aq |
| ↓ 55 | 3.27 |
| ↓ 70 | 4.33 |
| | S · 2Aq + S · Aq |
| 74.5U | 4.64 |
| | S · Aq |
| 80 | 4.61 |
| 85 | 4.77 |
| 90 | 5.09 |
| 95 | 5.59 |

**$KMnO_4$ (31, 224, 387, 505, 511, 512)**

| | |
|---|---|
| | S |
| 0 | 0.180 |
| 10 | 0.272 |
| 20 | 0.405 |
| 25 | 0.484 |
| 30 | 0.569 |
| 40 | 0.793 |
| 50 | 1.065 |
| 65 | 1.584 |

**$K_2Fe(SO_4)_2$ (281)**

| $t$, °C | M* |
|---|---|
| | S · 6Aq |
| 0 | 0.62 |
| 10 | 0.75 |
| 20 | 0.89 |
| 30 | 1.06 |
| 40m | 1.24 |
| | S · 6Aq + S · 4Aq |
| 30U | 1.06 |

* Per l soln.

**$K_2Fe(SO_4)_2$.—(*Continued*)**

| *t*, °C | M* |
|---|---|
| S · 6Aq + S · 2Aq | |
| 50mU | 1.47 |
| S · 4Aq | |
| 40 | 1.10 |
| 60 | 1.21 |
| 80 | 1.37 |
| 90m | 1.48 |
| S · 4Aq + S · 2Aq | |
| 86U | 1.44 |
| S · 2Aq | |
| 60m | 1.46 |
| 80m | 1.44 |
| 100 | 1.43 |

* Per 1 soln.

**$K_3Fe(CN)_6$ (517)**

| *t*, °C | M |
|---|---|
| S | |
| 0 | 0.92 |
| 10 | 1.11 |
| 20 | 1.34 |
| 30 | 1.59 |
| 40 | 1.85 |

**$K_4Fe(CN)_6$ (54, 144, 146, 210, 327, 448, 508, 514)**

| S · 3Aq | |
|---|---|
| 0 | 0.396 |
| 20 | 0.762 |
| 40 | 1.130 |
| 100 | 2.224 |

**$K_2SO_4.CoSO_4$ (299)**

| S · 6Aq | |
|---|---|
| 25 | 0.391 |

**$K_3Co(C_2O_4)_3$ (249)**

*l*-Trioxalocobaltiate

| S · Aq | |
|---|---|
| 20 | 0.849 |
| 22 | 0.854 |

**$K_3Co(C_2O_4)_3$ (249)**

*dl*-Trioxalocobaltiate

| S · 3.5Aq | |
|---|---|
| 0 | 0.784 |
| 14 | 0.836 |

**$K_2SO_4.NiSO_4$ (299)**

| S · 6Aq | |
|---|---|
| 25 | 0.209 |

**$K_2CrO_4$ (3, 106, 144, 201, 264, 327, 363, 447, 449)**

| *t*, °C | M ± 1% |
|---|---|
| S | |
| −10 | 2.84 |
| 0 | 2.96 |
| +20 | 3.22 |
| 40 | 3.49 |
| 60 | 3.78 |
| 80 | 4.09 |
| 100 | 4.45 |
| 110 | 4.66 |

**$K_2Cr_2O_7$ (3, 144, 199, 264, 287, 327, 449, 495)**

| *t*, °C | M ± 5% |
|---|---|
| S | |
| 0 | 0.158 |
| 10 | 0.240 |
| 20 | 0.390 |

**$K_2Cr_2O_7$.—(*Continued*)**

| *t*, °C | M ± 5% |
|---|---|
| S | |
| 30 | 0.616 |
| 40 | 0.90 |
| 50 | 1.21 |
| 60 | 1.54 |
| 80 | 2.31 |
| 100* | 3.30 |
| 120 | 4.60 |
| 140 | 5.94 |
| 160 | 7.40 |
| 180 | 9.08 |

* Above 100° less accurate.

**$K_2SO_4.Cr_2(SO_4)_3$ (298)**

| *t*, °C | M |
|---|---|
| S · 12Aq | |
| 25 | 0.44 |

**$KAl(SO_4)_2$ (36, 57, 298, 310)**

| *t*, °C | M ± 3% |
|---|---|
| S · 12Aq | |
| 0 | 0.117 |
| 10 | 0.162 |
| 20 | 0.228 |
| 30 | 0.320 |
| 40 | 0.458 |
| 50 | 0.664 |
| 60 | 0.948 |
| 70 | 1.390 |
| 80 | 2.12 |
| 85 | 2.72 |
| 88 | 3.48 |

**$K_2SO_4.BeSO_4$ (59)**

| *t*, °C | M |
|---|---|
| S · 2Aq | |
| 25 | 1.43 |

**$KNaCO_3$ (375)**

| S · 6Aq | |
|---|---|
| 25 | 5.14 |

**$KNaC_4H_4O_6$ (65, 235)**

Tartrate

| S · 4Aq | |
|---|---|
| − 4.3 | 1.24 |
| 0 | 1.50 |
| +10 | 2.24 |
| 20 | 3.23 |
| 30 | 4.90 |

**$KNaC_4H_4O_6$ (65, 235)**

Racemate

| S · 3Aq | |
|---|---|
| − 6.3 | 1.84 |
| 0 | 2.14 |
| +10 | 2.77 |
| 20 | 3.50 |
| 30 | 4.45 |

**RbOH (168)**

| | |
|---|---|
| 15 | 17.5 |

**RbCl (36)**

| *t*, °C | M ± 1% |
|---|---|
| S | |
| 0 | 6.36 |
| 10 | 6.96 |
| 20 | 7.53 |
| 30 | 8.07 |
| 90 | 11.02 |
| 110 | 11.95 |

**$RbClO_3$ (76, 80, 408)**

| *t*, °C | M ± 3% |
|---|---|
| S | |
| 0 | 0.127 |
| 10 | 0.201 |
| 20 | 0.319 |
| 30 | 0.474 |
| 40 | 0.680 |
| 50 | 0.946 |
| 60 | 1.32 |
| 70 | 1.75 |
| 80 | 2.26 |
| 90 | 2.88 |
| 100 | 3.82 |

**$RbClO_4$ (76, 80, 157)**

| *t*, °C | M ± 5% |
|---|---|
| S | |
| 10 | 0.0345 |
| 20 | 0.053 |
| 30 | 0.083 |
| 40 | 0.132 |
| 50 | 0.192 |
| 60 | 0.262 |
| 70 | 0.363 |
| 80 | 0.500 |
| 90 | 0.685 |
| 100 | 0.975 |

**RbBr (408, 422)**

| *t*, °C | M ± 2% |
|---|---|
| S | |
| 0 | 5.38 |
| 20 | 6.68 |
| 60 | 9.32 |
| 80 | 10.60 |
| 100 | 11.73 |
| 110 | 12.25 |

**$RbBrO_3$ (73)**

| *t*, °C | M ± 1% |
|---|---|
| S | |
| 25 | 0.137 |
| 30 | 0.166 |
| 35 | 0.201 |
| 40 | 0.238 |

**RbI (408)**

| *t*, °C | M |
|---|---|
| S | |
| 6.9 | 6.47 |
| 17.4 | 7.16 |

**$RbIO_4$ (23)**

| S | |
|---|---|
| 13 | 0.0236 |

**$Rb_2SO_4$ (36, 144)**

| *t*, °C | M ± 1% |
|---|---|
| S | |
| 0 | 1.36 |
| 10 | 1.58 |
| 20 | 1.79 |
| 30 | 2.00 |
| 40 | 2.20 |
| 50 | 2.37 |
| 90 | 2.95 |
| 110 | 3.16 |

**$Rb_2SeO_4$ (506)**

| *t*, °C | M |
|---|---|
| 12 | 5.06 |

**$RbNO_3$ (36)**

| *t*, °C | M ± 2% |
|---|---|
| S | |
| 0 | 1.33 |
| 10 | 2.26 |
| 20 | 3.65 |
| 30 | 5.55 |
| 40 | 7.90 |
| 50 | 10.6 |
| 60 | 13.6 |
| 70 | 17.1 |
| 80 | 21.1 |
| 90 | 25.6 |
| 100 | 30.5 |
| 110 | 36.2 |
| 120 | 43.2 |

**$Rb_2CO_3$ (166)**

| *t*, °C | M |
|---|---|
| 15 | 9.6 |

**$RbHCO_2$ (464)**

Formate

| *t*, °C | M ± 2% |
|---|---|
| S · Aq | |
| 0 | 26.0 |
| 10 | 34.2 |
| S · Aq + S · 0.5Aq | |
| 16.5U | 42.4 |
| S · 0.5Aq | |
| 20 | 43.6 |
| 25 | 45.1 |
| 30 | 46.7 |
| 40 | 52.1 |
| 50 | 62.8 |
| S · 0.5Aq + S | |
| 51U | 65.2 |
| S | |
| 50m | 64.7 |
| 60 | 68.4 |
| 80 | 83.3 |
| 100 | 114.3 |
| 120 | 173.8 |
| 140 | 314 |
| 160 | 1065 |
| 170 | ∞ |

**$RbHCO_3$ (167)**

| *t*, °C | M |
|---|---|
| 15 | 7.9 |

**$RbCH_3CO_2$ (464)**

Acetate

| *t*, °C | M ± 2% |
|---|---|
| S | |
| 0 | 34.3 |
| 40 | 40.7 |
| 80 | 51.2 |
| 120 | 70.6 |
| 160 | 114.3 |
| 200 | 250 |
| 240 | 2360 |
| 246 | ∞ |

**$Rb_2C_4H_4O_8$ (152)**

Dihydroxytartrate

| *t*, °C | M |
|---|---|
| 0 | 0.198 |

**$RbC_6H_5CO_2$ (463)**
Benzoate

| $t$, °C | M ± 3% |
|---|---|
| S | |
| 20 | 6.26 |
| 40 | 6.78 |
| 60 | 7.47 |
| 80 | 8.27 |
| 100 | 9.17 |
| 120 | 10.12 |
| 140 | 11.10 |

**$RbC_7H_5O_3$ (463)**
Salicylate

| $t$, °C | M ± 2% |
|---|---|
| S · Aq | |
| 10 | 8.4 |
| 20 | 9.5 |
| 30 | 10.9 |
| S · Aq + S | |
| 40U | 12.8 |
| S | |
| 50 | 13.5 |
| 60 | 14.4 |
| 80 | 16.8 |
| 100 | 20.4 |
| 120 | 25.0 |
| 130 | 27.5 |

**$RbC_7H_5O_3$ (463)**
*m*-Hydroxybenzoate

| | |
|---|---|
| S · Aq | |
| −10 | 4.30 |
| 0 | 4.40 |
| +10 | 4.56 |
| 20 | 4.82 |
| 30 | 5.32 |
| 40 | 6.10 |
| S · Aq + S | |
| 47U | 7.00 |
| S | |
| 50 | 7.20 |
| 60 | 8.00 |
| 80 | 9.36 |
| 100 | 11.62 |
| 120 | 15.62 |
| 130 | 17.90 |

**$RbC_7H_5O_3$ (463)**
*p*-Hydroxybenzoate

| | |
|---|---|
| S · Aq | |
| 20 | 2.60 |
| 30 | 3.04 |
| 40 | 3.58 |
| 50 | 4.16 |
| 60 | 4.92 |
| 70 | 5.84 |
| S · Aq + S | |
| 78U | 6.80 |
| S | |
| 80 | 6.96 |
| 90 | 7.86 |
| 100 | 9.20 |
| 110 | 10.80 |
| 120 | 12.64 |

**$Rb_2(TeC_2O_4(OH)_6)$ (433)**
Oxalotellurate

| $t$, °C | M ± 2% |
|---|---|
| S | |
| 0 | 0.079 |
| 10 | 0.107 |
| 20 | 0.148 |
| 30 | 0.192 |
| 40 | 0.261 |
| 50 | 0.346 |

**$Rb_2SO_4.ZnSO_4$ (299)**

| $t$, °C | M |
|---|---|
| S · 6Aq | |
| 25 | 0.236 |

**$RbBr.CdBr_2$ (422)**

| | |
|---|---|
| S | |
| 0 | 1.11 |
| 20 | 1.87 |
| 40 | 2.70 |
| 60 | 3.73 |
| 80 | 4.93 |
| 100 | 6.41 |
| 110 | 7.44 |

**$4RbCl.CdBr_2$ (422)**

| | |
|---|---|
| 0 | 0.96 |
| 20 | 1.48 |
| ↓ 120 | 4.20 |

**$Rb_2SO_4.CdSO_4$ (299)**

| | |
|---|---|
| S · 6Aq | |
| 25 | 1.63 |

**$Rb_2SO_4.CuSO_4$ (299)**

| | |
|---|---|
| S · 6Aq | |
| 25 | 0.242 |

**$RbAuCl_4$ (429)**

| $t$, °C | M ± 3% |
|---|---|
| S | |
| 10 | 0.113 |
| 20 | 0.223 |
| 30 | 0.365 |
| 40 | 0.507 |
| 50 | 0.672 |
| ↓ 80 | 1.29 |
| ↓ 100 | 1.87 |

**$RbMnO_4$ (352, 387)**

| $t$, °C | M ± 5% |
|---|---|
| S | |
| 0 | 0.020 |
| 7 (352) | 0.048 |
| 10 | 0.035 |
| 20 | 0.053 |
| 30 | 0.079 |
| 40 | 0.113 |
| 50 | 0.159 |
| 60 | 0.229 |

**$Rb_2SO_4.MnSO_4$ (299)**

| $t$, °C | M |
|---|---|
| S · 6Aq | |
| 25 | 0.86 |

**$RbFe(SO_4)_2$ (298)**

| | |
|---|---|
| S · 12Aq | |
| 25 | 0.295 |

**$Rb_2Fe(SO_4)_2$ (299)**

| | |
|---|---|
| S · 6Aq | |
| 25 | 0.58 |

**$Rb_2SO_4.CoSO_4$ (299)**

| $t$, °C | M |
|---|---|
| S · 6Aq | |
| 25 | 0.221 |

**$Rb_2SO_4.NiSO_4$ (299)**

| | |
|---|---|
| S · 6Aq | |
| 25 | 0.142 |

**$RbCr(SO_4)_2$ (298)**

| | |
|---|---|
| S · 12Aq | |
| 25 | 0.079 |
| 30 | 0.096 |
| 35 | 0.128 |
| 40 | 0.181 |

**$RbV(SO_4)_2$ (298)**

| | |
|---|---|
| S · 12Aq | |
| 25 | 0.177 |

**$RbAl(SO_4)_2$ (36, 298, 459)**

| $t$, °C | M ± 2% |
|---|---|
| S · 12Aq | |
| 0 | 0.0236 |
| 10 | 0.0343 |
| 20 | 0.0503 |
| 30 | 0.0725 |
| 40 | 0.104 |
| 50 | 0.158 |
| 60 | 0.241 |
| 70 | 0.412 |

**$Rb_2SO_4.MgSO_4$ (299)**

| $t$, °C | M |
|---|---|
| S · 6Aq | |
| 25 | 0.523 |

**CsOH (168)**

| | |
|---|---|
| 15 | 25.8 |

**CsCl (36, 160, 233)**

| $t$, °C | M ± 0.5% |
|---|---|
| S | |
| 0 | 9.61 |
| 10 | 10.32 |
| 20 | 10.98 |
| 25 | 11.34 |
| 30 | 11.68 |
| 40 | 12.34 |
| 50 | 12.98 |
| ↓ 60 | 13.61 |
| ↓ 100 | 16.07 |
| 120 | 17.26 |

**$CsClO_3$ (76)**

| $t$, °C | M ± 2% |
|---|---|
| S | |
| 0 | 0.114 |
| 10 | 0.178 |
| 20 | 0.293 |
| 30 | 0.445 |
| 40 | 0.642 |
| 50 | 0.900 |
| 60 | 1.21 |
| 70 | 1.58 |
| 80 | 2.13 |
| 90 | 2.81 |
| 100 | 3.64 |

**$CsClO_4$ (76, 80, 157)**

| | |
|---|---|
| S | |
| 10 | 0.043 |
| 20 | 0.069 |

**$CsClO_4$.—(*Continued*)**

| $t$, °C | M ± 2% |
|---|---|
| S | |
| 25 | 0.088 |
| 30 | 0.111 |
| 40 | 0.165 |
| 50 | 0.229 |
| 60 | 0.315 |
| 70 | 0.420 |
| 80 | 0.600 |
| 90 | 0.90 |
| 100 | 1.27 |

**CsBr (162)**

| $t$, °C | M |
|---|---|
| S | |
| 25 | 5.80 |

**$CsBrO_3$ (73)**

| | |
|---|---|
| S | |
| 25 | 0.1404 ±1% |
| 30 | 0.174 ±1% |
| 35 | 0.204 ±1% |

**CsI (159)**

| | |
|---|---|
| S | |
| − 4.0 | 1.48 |
| +35.6 | 4.06 |

**$CsIO_4$ (23)**

| | |
|---|---|
| 15 | 0.0664 |

**$Cs_2SO_4$ (36)**

| $t$, °C | M ± 1% |
|---|---|
| S | |
| 0 | 4.62 |
| 10 | 4.78 |
| 20 | 4.93 |
| 30 | 5.08 |
| 40 | 5.23 |
| ↓ 50 | 5.38 |
| ↓ 110 | 6.23 |

**$Cs_2SeO_4$ (506)**

| $t$, °C | M |
|---|---|
| S | |
| 12 | 6.00 |

**$CsNO_3$ (36)**

| $t$, °C | M ± 3% |
|---|---|
| S | |
| 0 | 0.47 |
| 10 | 0.79 |
| 20 | 1.26 |
| 30 | 1.86 |
| 40 | 2.61 |
| 50 | 3.50 |
| 60 | 4.52 |
| 70 | 5.64 |
| 80 | 6.92 |
| 90 | 8.40 |
| 100 | 10.10 |
| 110 | 12.2 |

**$Cs_2CO_3$ (166)**

| $t$, °C | M |
|---|---|
| 15 | 8.0 |

**$Cs_2C_2O_4$ (165)**
oxalate

| | |
|---|---|
| 25 | 8.86 |

**$CsHCO_2$ (464)**
Formate

| $t$, °C | M ± 2% |
|---|---|
| S · Aq | |
| 0 | 18.8 |
| 10 | 21.3 |
| 20 | 24.6 |
| 30 | 29.6 |
| 40 | 38.9 |
| 43 | 45.4 |
| 45 | 55.5 |
| 43 | 78.3 |
| S · Aq + S | |
| 41E | 90.6 |
| S | |
| 50 | 93.8 |
| 75 | 102.1 |
| 100 | 115.3 |
| 125 | 134.5 |
| 150 | 158.0 |
| 175 | 193.4 |
| 200 | 250 |
| 225 | 371 |
| 250 | 870 |
| 265 | ∞ |

**$CsHCO_3$ (167)**

| $t$, °C | M |
|---|---|
| 15 | 10.8 |

**$CsCH_3CO_2$ (464)**
Acetate

| $t$, °C | M ± 2% |
|---|---|
| 0 | 49.4 |
| 20 | 52.7 |
| 40 | 55.5 |
| 60 | 60.0 |
| 80 | 65.9 |
| 100 | 76.3 |
| 120 | 94.5 |
| 140 | 129.5 |
| 160 | 206.5 |
| 180 | 480 |
| 194 | ∞ |

**$Cs_2C_4H_4O_8$ (152)**
Dihydroxytartrate

| $t$, °C | M |
|---|---|
| 0 | 0.65 |

**$CsC_6H_5CO_2$ (463)**
Benzoate

| $t$, °C | M ± 2% |
|---|---|
| 0 | 11.60 |
| 20 | 12.00 |
| 60 | 13.68 |
| 80 | 14.62 |
| 100 | 15.74 |
| 120 | 17.02 |

**$CsC_7H_5O_3$ (463)**
Salicylate

| | |
|---|---|
| S · Aq | |
| 0 | 7.27 |
| 10 | 8.51 |
| 20 | 10.66 |
| 30 | 13.88 |
| 40 | 17.82 |

**$CsC_7H_5O_3$.—(*Continued*)**

| $t$, °C | M ± 2% |
|---|---|
| S · Aq + S · 0.5Aq | |
| 41U | 18.5 |
| S · 0.5Aq | |
| 50 | 20.5 |
| 60 | 26.1 |
| 70 | 36.4 |
| S · 0.5Aq + S | |
| 74U | 41.9 |
| S | |
| 80 | 45.1 |
| 90 | 50.6 |
| 100 | 56.4 |
| 110 | 63.1 |

**$CsC_7H_5O_3$ (463)**
*m*-Hydroxybenzoate

| | |
|---|---|
| S · $x$Aq | |
| 10 | 12.4 |
| 20 | 13.7 |
| 30 | 17.2 |
| 40 | 23.4 |
| S · $x$Aq + S | |
| 44U | 27.1 |
| S | |
| 50 | 28.1 |
| 60 | 29.9 |
| 80 | 34.7 |
| 100 | 41.4 |
| 120 | 49.4 |

**$CsC_7H_5O_3$ (463)**
*p*-Hydroxybenzoate

| | |
|---|---|
| S · Aq | |
| 10 | 1.80 |
| 20 | 2.22 |
| 30 | 2.66 |
| 40 | 3.20 |
| 50 | 3.80 |
| 60 | 4.60 |
| S · Aq + S | |
| 64U | 5.00 |
| S | |
| 70 | 5.32 |
| 80 | 6.04 |
| 100 | 7.96 |
| 120 | 10.80 |
| 135 | 14.28 |

**$Cs_2[TeC_2O_4(OH)_6]$ (433)**
Oxalotellurate

| | |
|---|---|
| S | |
| 0 | 0.110 |
| 10 | 0.152 |
| 20 | 0.202 |
| 30 | 0.259 |
| 40 | 0.339 |
| 50 | 0.474 |

**$CsGa(SO_4)_2$ (119)**

| $t$, °C | M |
|---|---|
| S · 12Aq | |
| 25 | 0.0383 |

**$CsGa(SeO_4)_2$ (119)**

| | |
|---|---|
| S · 12Aq | |
| 25 | 0.085 |

**$CsIn(SO_4)_2$ (298)**

| $t$, °C | M |
|---|---|
| S · 12Aq | |
| 25 | 0.172 |

**$Cs_2SO_4.ZnSO_4$ (299)**

| | |
|---|---|
| S · 6Aq | |
| 25 | 0.74 |

**$Cs_2SO_4.CdSO_4$ (299)**

| | |
|---|---|
| S · 6Aq | |
| 25 | 2.46 |

**$Cs_2SO_4.CuSO_4$ (299)**

| | |
|---|---|
| S · 6Aq | |
| 25 | 0.89 |

**$CsAuCl_4$ (429)**

| $t$, °C | M ± 5% |
|---|---|
| S | |
| 10 | 0.0106 |
| 20 | 0.0170 |
| 30 | 0.036 |
| 40 | 0.070 |
| 50 | 0.121 |
| 60 | 0.189 |
| 70 | 0.289 |
| 80 | 0.413 |
| 90 | 0.587 |
| 100 | 0.803 |

**$CsMnO_4$ (387)**

| | |
|---|---|
| S | |
| 0 | 0.0037 |
| 10 | 0.0058 |
| 20 | 0.0092 |
| 30 | 0.0146 |
| 40 | 0.0216 |
| 50 | 0.0333 |
| 60 | 0.0520 |

**$Cs_2SO_4.MnSO_4$ (299)**

| $t$, °C | M |
|---|---|
| S · 6Aq | |
| 25 | 1.57 |

**$CsFe(SO_4)_2$ (298)**

| $t$, °C | M |
|---|---|
| S · 12Aq | |
| 25 | 0.045 |
| 30 | 0.066 |
| 35 | 0.099 |
| 40 | 0.156 |

**$Cs_2Fe(SO_4)_2$ (299)**

| | |
|---|---|
| S · 6Aq | |
| 25 | 1.99 |

**$Cs_2SO_4.CoSO_4$ (299)**

| | |
|---|---|
| S · 6Aq | |
| 25 | 0.81 |

**$Cs_2SO_4.NiSO_4$ (299)**

| | |
|---|---|
| S · 6Aq | |
| 25 | 0.50 |

**$CsCr(SO_4)_2$ (298)**

| | |
|---|---|
| S · 12Aq | |
| 25 | 0.016 |
| 40 | 0.041 |

**$CsV(SO_4)_2$ (298)**

| | |
|---|---|
| S · 12Aq | |
| 25 | 0.020 |

**$CsAl(SO_4)_2$ (36, 212, 298, 459)**

| $t$, °C | M ± 5% |
|---|---|
| S · 12Aq | |
| 0 | 0.006 |
| 10 | 0.009 |
| 20 | 0.012 |
| 30 | 0.017 |
| 40 | 0.024 |
| 50 | 0.038 |
| 60 | 0.058 |
| 70 | 0.095 |
| 80 | 0.162 |
| 90 | 0.302 |
| 100 | 0.62 |

**$Cs_2SO_4.MgSO_4$ (298)**

| $t$, °C | M |
|---|---|
| S · 6Aq | |
| 25 | 1.11 |

## LITERATURE

(For a key to the periodicals see end of volume)


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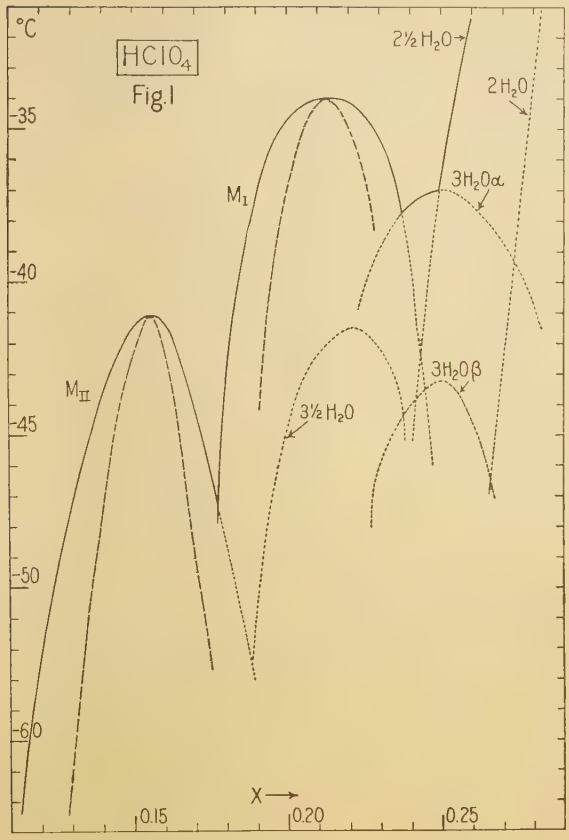


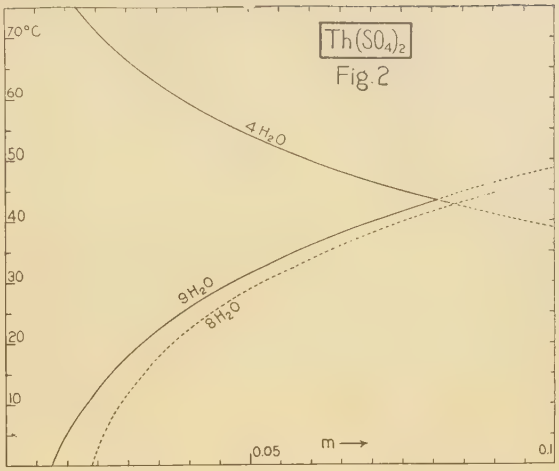


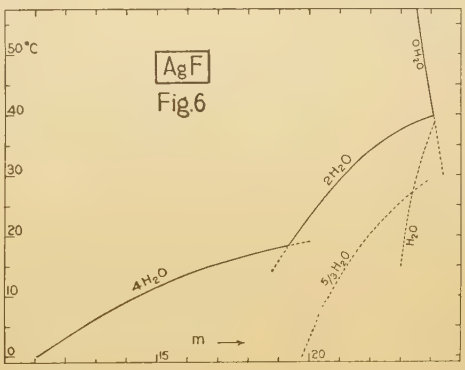


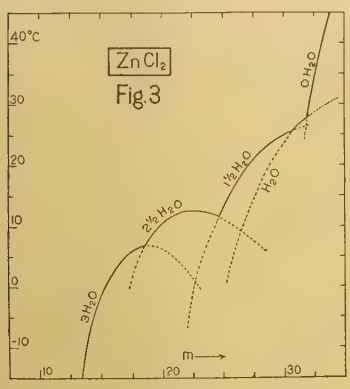


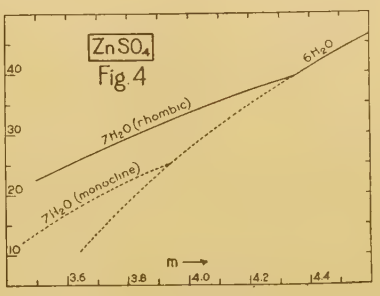


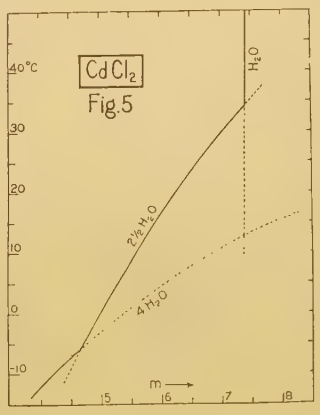


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(60) Brönsted, *7*, **56**: 645; 07. (61) Brönsted, *7*, **68**: 693; 09. (62) Brönsted, *7*, **77**: 129; 11. (63) Brönsted, *7*, **82**: 621; 13. (64) Brönsted, *137*, **12**: No. 6; 15. (65) Brönsted, *137*, **12**: No. 12; 15. (66) Brönsted, *7*, **100**: 139; 22. (67) Brönsted, *1*, **44**: 877; 22. (68) Brönsted and La Mer, *1*, **46**: 555; 24. (69) Brönsted and Petersen, *1*, **43**: 2265; 21.
(70) Bruni, *36*, **27 I**: 537; 97. (71) Buchanan and Winner, *45*, **12**: 448; 20. (72) Büchner and Prins, *7*, **81**: 113; 13. (73) Buell and McCrosky, *1*, **43**: 2031; 21. (74) Bury, *4*, **125**: 2538; 24. (75) Callendar and Barnes, *5*, **62**: 117; 98. (76) Calzolari, *36*, **42 II**: 85; 12. (77) Cameron and Robinson, *50*, **11**: 273; 07. (78) Cantoni and Basadonna, *27*, **35**: 727; 06. (79) Cantoni and Zachoder, *27*, **33**: 747; 05.
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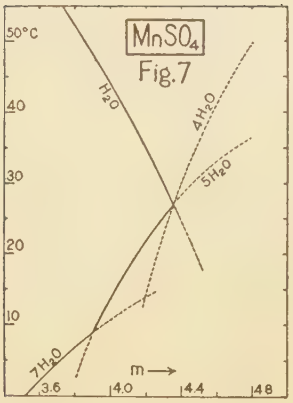
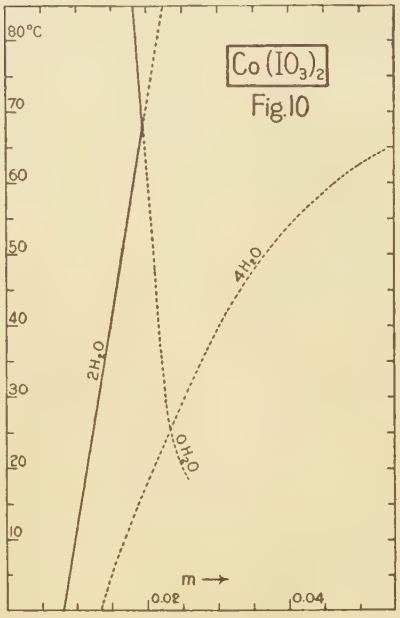
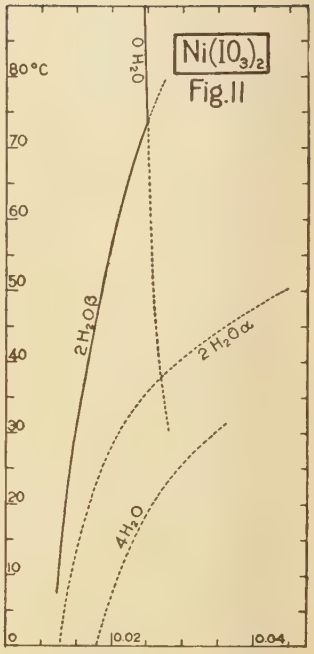
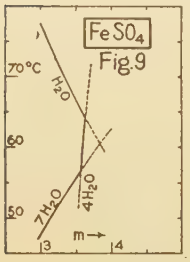
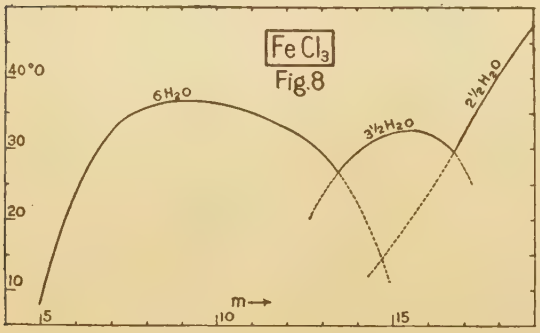
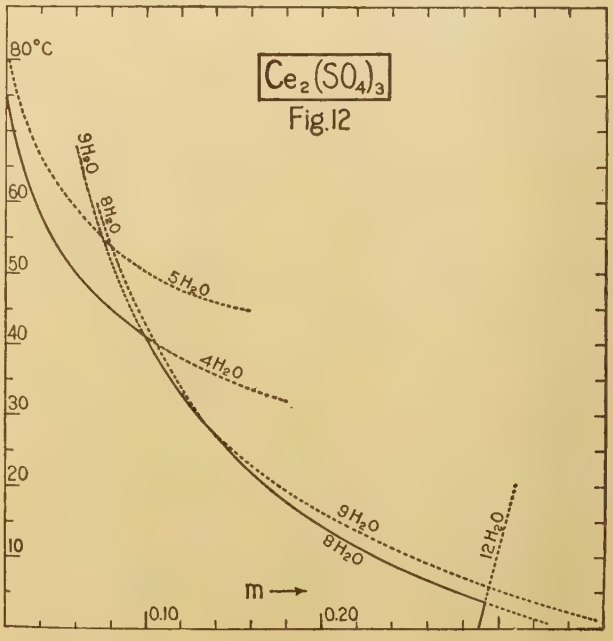

MnSO4
Fig.7
50°C
40
30
20
10
H2O
4H2O
5H2O
7H2O
m →
3.6
4.0
4.4
4.8

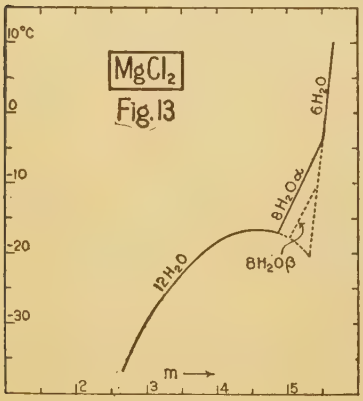

Co(IO3)2
Fig.10
80°C
70
60
50
40
30
20
10
2H2O
4H2O
0H2O
m →
0.02
0.04

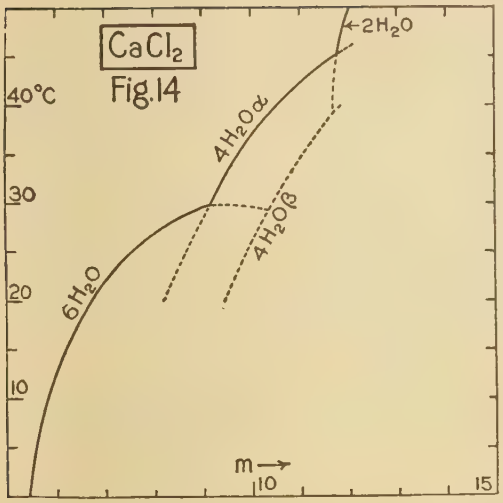

Ni(IO3)2
Fig.11
80°C
70
60
50
40
30
20
10
0
0²H2O
2H2Oβ
2H2Oα
4H2O
0.02
0.04

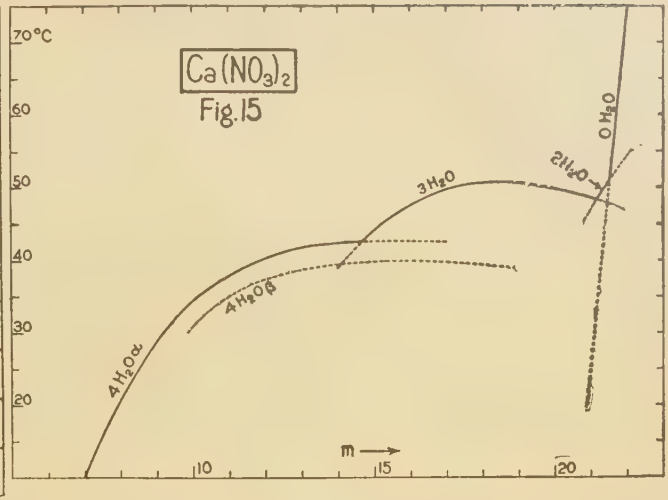

FeSO4
Fig.9
70°C
60
50
H2O
7H2O
4H2O
m →
3
4

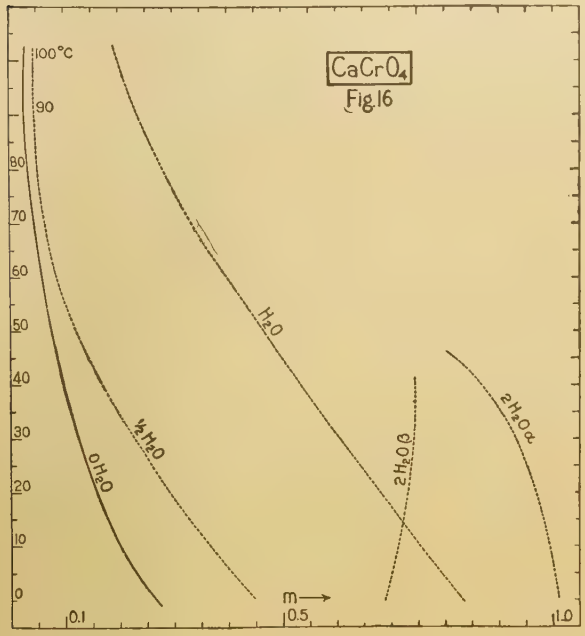

FeCl3
Fig.8
40°C
30
20
10
6H2O
3½H2O
2½H2O
m →
5
10
15

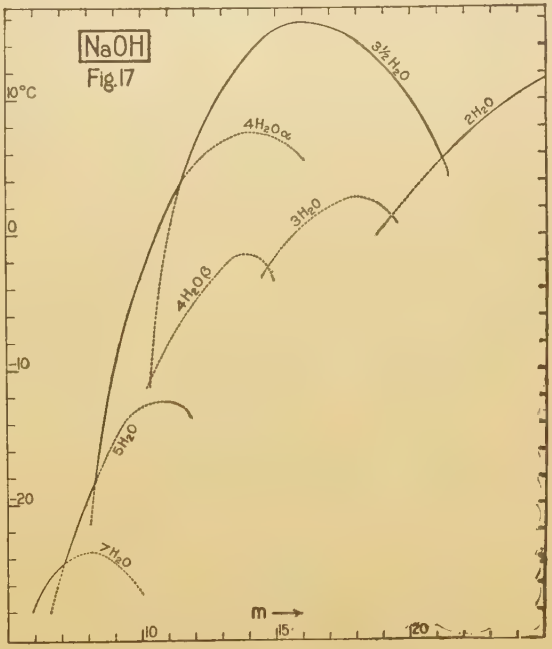

Ce2(SO4)3
Fig.12
80°C
60
50
40
30
20
10
9H2O
8H2O
5H2O
4H2O
9H2O
8H2O
12H2O
m →
0.10
0.20


MgCl2
Fig.13
10°C
0
-10
-20
-30
6H2O
8H2Oα
8H2Oβ
12H2O
m →
2
3
4
5

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(100) Cohen, Voller and Moesveld, *7*, **104**: 323; 23. (101) Cohen and Wolters, *7*, **96**: 253; 20. (102) Colani, *27*, **19**: 405; 16. (103) Colani, *34*, **165**: 111; 17. (104) Coppadoro, *36*, **42 I**: 233; 12. (105) de Coppet, *6*, **30**: 411; 83. (106) de Coppet, *7*, **22**: 239; 97. (107) Cottrell, *50*, **4**: 637; 00. (108) Courtois, *54*, **158**: 1511; 14. (109) Creighton and Ward, *1*, **37**: 2333; 15.
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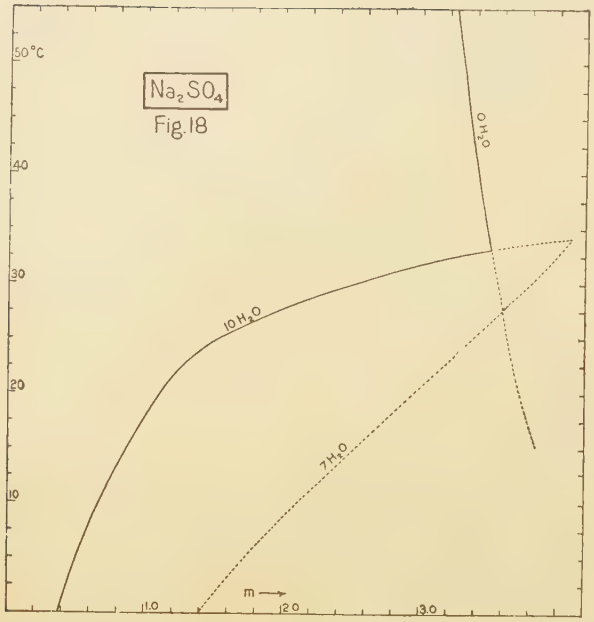
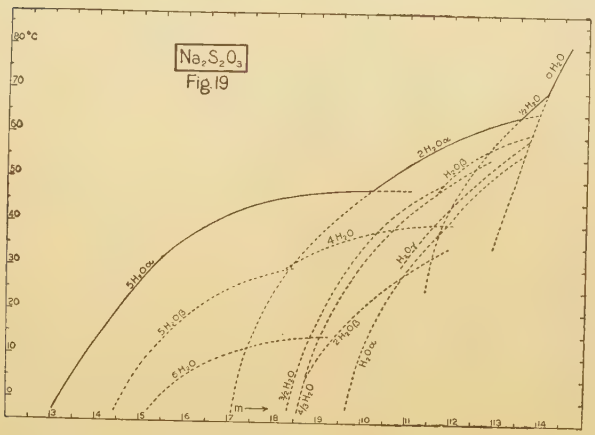
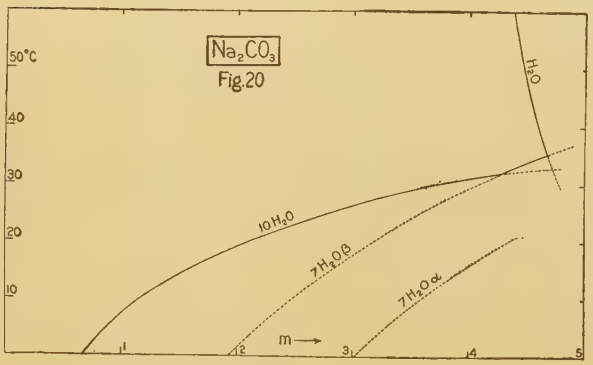
(140) Engel, *6*, **17**: 338; 89. (141) Ephraim, *25*, **56**: 1530; 23. (142) Ephraim and Mosimann, *25*, **55**: 1608; 22. (143) Epplo, *Diss.*, Heidelberg, 1899. (144) Étard, *6*, **2**: 503; 94. (145) Euler, *7*, **49**: 303; 04. (146) Fabris, *36*, **51 II**: 374; 21. (147) Fajans and Fischler, *93*, **95**: 284; 16. (148) Fajans and Lembert, *93*, **95**: 297; 16. (149) Fedotiev, *7*, **49**: 162; 04.
(150) Fedotiev, *93*, **73**: 173; 11. (151) Fedotiev and Koltunov, *93*, **85**: 247; 14. (152) Fenton, *4*, **73**: 472; 98. (153) Ferchland, *93*, **30**: 130; 02. (154)

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(210) Harkins and Pearce, *1*, **38**: 2714; 16. (211) Harkins and Winninghoff, *1*, **33**: 1827; 11. (212) Hart and Huselton, *1*, **36**: 2082; 14. (213) Hartley and Barret, *4*, **95**: 1178; 09. (214) Hartley, Drugman, Vlieland and Bourdillon, *4*, **103**: 1747; 13. (215) Haslam, Calingaert and Taylor, *1*, **46**: 308; 24. (216) Hecht, *13*, **213**: 65; 82. (217) van der Heide, *7*, **12**: 416; 93. (218) Hendrixson, *1*, **42**: 724; 20. (219) Herold, *9*, **11**: 415; 05.

(220) Herz, *93*, **33**: 355; 03. (221) Herz, *93*, **67**: 365; 10. (222) Herz, *93*, **73**: 274; 12. (223) Herz and Anders, *93*, **52**: 164; 07. (224) Herz and Knoch, *93*, **41**: 315; 04. (225) Herz and Paul, *93*, **82**: 431; 13. (226) Herzfeld, *445*, **47**: 817; 97. (227) Hevesy, Christiansen and Berglund, *93*, **144**: 69; 25. (228) Hill, *1*, **32**: 1186; 10. (229) Hill, *1*, **39**: 218; 17.

(230) Hill, *1*, **43**: 254; 21. (231) Hill, *1*, **44**: 1163; 22. (232) Hill and Simmons, *1*, **31**: 821; 09. *7*, **67**: 594; 09. (233) Hinrichsen and Sachsel, *7*, **50**: 81; 05. (234) van't Hoff, Armstrong, Hinrichsen, Weigert and Just, *7*, **45**: 257; 03. (235) van't Hoff and Goldschmidt, *7*, **17**: 505; 95. (236) van't Hoff and Meyerhoffer, *7*, **27**: 75; 98. (237) van't Hoff, Meyerhoffer and Smith, *76*, **1901 II**: 1034. (238) Hofmann, Höbold and Quoos, *13*, **386**: 304; 12. (239) Horn and van Wagener, *11*, **30**: 344; 03.

(240) Hulett, *7*, **37**: 385; 01. (241) Hulett and Allen, *1*, **24**: 667; 02. (242) Imadsu, *479*, **3**: 247; 12. (243) Inamura, *429*, **4**: 105; 20. (244) Ishikawa, *41*, **43**: 560; 22. (245) Ishikawa and Kimura, *469*, **5**: 1; 26. (246) Iwig and Hecht, *13*, **233**: 166; 86. (247) Jackman and Brown, *4*, **121**: 694; 22. (248) Jäger, *93*, **27**: 22; 01. (249) Jäger and Thomas, *64P*, **21**: 693; 19. (249.5) James, Fogg, McIntire, Evans and Donovan, *1*, **49**: 132; 27.

(250) James and Whittemore, *1*, **34**: 1168; 12. (251) Jellinek, *93*, **70**: 93; 11. (252) Jo, *479*, **3**: 41; 12. (252.5) Johnston, *1*, **37**: 2001; 15. (253) de Jong, *70*, **28**: 342; 09. (254) Joseph, *4*, **117**: 377; 20. (255) Katz and James, *1*, **35**: 872; 13. (256) Ketner, *7*, **39**: 641; 02. (257) King, *Diss.*, Zurich, 1912. (257.5) Kline, *Diss.*, Yale, 1923. (258) Knietsch, *25*, **34**: 4069; 01. (259) Knox and Will, *4*, **115**: 853; 19.

(260) Kohnstamm and Cohen, *8*, **65**: 344; 98. (261) Konovalov, *53*, **31**: 985; 99. (262) Koppel, *93*, **41**: 377; 04. (263) Koppel, *25*, **39**: 3738; 06. (264) Koppel and Blumenthaal, *93*, **53**: 228; 07. (265) Koppel and Cahn, *93*, **60**: 53; 08. (266) Koppel, Wetzel, Gumperz and Koppel, *7*, **52**: 385; 05. (267) Krasnicki, *57*, **8**: 595; 87. (267.5) Kraus, *1*, **49**: 1226; 27. (268) Krauss and Gerlach, *93*, **140**: 61; 24. (269) Kremann, *57*, **32**: 619; 11.

(270) Kremann and Hofmeier, *57*, **29**: 1111; 08. *75*, **117 II b**: 735; 08. (271) Kremann and Hüttinger, *323*, **58**: 637; 09. (272) Kremann and Kerschbaum, *93*, **56**: 218; 08. (273) Kremann and Noss, *57*, **33**: 1205; 12. (274) Kremann and Rodemund, *93*, **86**: 373; 14. (275) Kremers, *8*, **92**: 497; 54. (276) Kremers, *8*, **95**: 468; 55. (277) Kremers, *8*, **97**: 1; 56. (278) Kremers, *8*, **99**: 25; 56. (279) Kremers, *8*, **103**: 57; 58.

(280) Küster and Kremann, *93*, **41**: 1; 04. (281) Küster and Thiel, *93*, **21**: 116; 99. (282) Kuznecov, *53*, **29**: 330; 97. (283) Lagerlotz, *293*, **256**: 123; 18. (284) Lamb and Simmons, *1*, **43**: 2188; 21. (285) Lamy, *6*, **67**: 385; 63. (286) Landau, *57*, **14**: 707; 93. (287) Le Blanc and Schmandt, *7*, **77**: 614; 11. (288) Le Chatelier, *34*, **124**: 1091; 97. (289) Lehrfeld, *Diss.*, Zurich, 1915.

(290) Levi, *36*, **53**: 522; 23. (291) Levi-Malvano, *93*, **48**: 446; 06. (292) Lewis and Brighton, *1*, **39**: 1906; 17. (293) Lewis and Brighton, *1*, **40**: 482; 18. (294) Ley and Schäfer, *25*, **39**: 1259; 06. (295) Lichty, *1*, **25**: 469; 03.

(296) Lidbury, *7*, **39**: 453; 02. (297) Lind, Underwood and Whittemore, *1*, **40**: 465; 18. (298) Locke, *11*, **26**: 166; 01. (299) Locke, *11*, **27**: 455; 02. (300) Loewel, *6*, **33**: 335; 51. (301) Loewel, *6*, **43**: 405; 55. (302) Loewel, *6*, **49**: 32; 57. (303) Lothian, *347*, **30**: 546; 00. (304) Lubarsky, *53*, **28**: 460; 97. (305) Lumsden, *4*, **81**: 350; 02. (306) Maben, *347*, **14**: 505; 84. (307) McCoy and Test, *1*, **33**: 473; 11. (308) Marden and Rich, *45*, **12**: 651; 20. (309) Marignac, *6*, **39**: 184; 53.

(310) Marino, *36*, **35 II**: 341; 05. (311) Massink, *Diss.*, Leiden, 1913. (312) Masson, *4*, **99**: 1132; 11. (313) Matignon, *34*, **133**: 289; 01. (314) Matignon, *172*, (7th), **2**: 53; 09. (315) Meerburg, *93*, **37**: 199; 03. (316) Meerburg, *93*, **45**: 324; 05. *176*, **1**: 474; 04. (317) Meerburg, *93*, **45**: 1; 05. (318) Meerburg, *Gedenkboek van Bemmelen*, **1910**: 356. (319) Melcher, *1*, **32**: 50; 10.

(320) Menshutkin, *93*, **52**: 152; 07. (321) Menzies and Humphry, *172*, (8th), **2**: 175; 12. (322) Meusser, *25*, **34**: 2432; 01. (323) Meusser, *25*, **35**: 1414; 02. (324) Meusser, *93*, **44**: 79; 05. (325) Meyer and Friedrich, *7*, **102**: 369; 22. (326) Meyerhoffer and Saunders, *7*, **31**: 370; 99. (327) Michel and Kraft, *6*, **41**: 471; 54. (328) Miczynski, *57*, **7**: 255; 86. (329) Middleberg, *7*, **43**: 305; 03.

(330) Milikan, *Diss.*, Leiden, 1914. (331) Millican, Joseph and Lowry, *4*, **121**: 959; 22. (332) Milojkovic, *57*, **14**: 699; 93. (333) Missenden, *135*, **124**: 362; 22. (334) Mohr, *7*, **27**: 193; 98. (335) Moles, University of Madrid, *0*. (336) Moles and Gonzales, *132*, **21**: 204; 23. (337) Moles and Marquina, *132*, **12**: 383; 14. (338) Mondain-Monval, *34*, **174**: 1014; 22. (339) Mondain-Monval, *34*, **175**: 162; 22.

(340) Morgan and James, *1*, **36**: 10; 14. (341) Morse, *7*, **41**: 709; 02. (342) Muir, *4*, **29**: 857; 76. (343) Muir, *135*, **33**: 15; 76. (344) Mulder, *B80*, p. 45, 68. (345) Mulder, *B80*, p. 58. (346) Mulder, *B80*, p. 97. (347) Mulder, *B80*, p. 118. (348) Müller, *7*, **31**: 354; 99. (349) Müller, *Diss.*, Zurich, 1915.

(350) Müller, *1*, **44**: 2493; 22. (351) Müller and Kaufmann, *7*, **42**: 497; 03. (352) Muthmann and Kuntze, *94*, **23**: 368; 94. (353) Muthmann and Rölig, *25*, **31**: 1718; 98. (354) Mylius, *25*, **34**: 2208; 01. (355) Mylius and Dietz, *25*, **34**: 2774; 01. (356) Mylius and Dietz, *93*, **44**: 209; 05. (357) Mylius and Funk, *25*, **30**: 1716; 97. (358) Mylius and Funk, *89*, **3**: 443; 00. (359) Mylius and Funk, *89*, **3**: 449; 00.

(360) Mylius and von Wrochem, *89*, **3**: 459; 00. (361) Nasini and Ageno, *7*, **69**: 482; 08. (362) Naumann and Rücker, *25*, **38**: 2292; 05. (363) Nordenskiöld, *8*, **136**: 309; 69. (364) Noyes, *7*, **6**: 241; 90. (365) Noyes, *7*, **9**: 603; 92. (366) Noyes and Abbot, *7*, **16**: 125; 95. (367) Noyes and Bray, *1*, **33**: 1643; 11. (368) Noyes and Clement, *7*, **13**: 412; 94. (369) Noyes and Kohr, *7*, **42**: 336; 03.

(370) Noyes and Sammet, *7*, **43**: 513; 03. (371) Noyes and Schwartz, *7*, **27**: 279; 98. (372) Oechsner de Coninck, *186*, **1901**: 349. (373) Osaka, *479*, **1**: 265; 08. (374) Osaka, *479*, **1**: 290; 08. (375) Osaka, *479*, **3**: 55; 11. (376) Osaka and Abe, *479*, **3**: 51; 11. (377) Osaka and Hara, *429*, **2**: 147; 17. (378) Osaka and Yoshida, *429*, **6**: 49; 22. (379) Oswald, *6*, **1**: 32; 14.

(380) Pajetta, *36*, **36 II**: 67; 06. (381) Parravano and Fornaini, *36*, **37 II**: 521; 07. (382) Parsons and Corson, *1*, **32**: 1383; 10. (383) Parsons and Whittemore, *1*, **33**: 1933; 11. (384) Partheil and Hübner, *293*, **241**: 412; 03. (385) Pascal and Ero, *27*, **25**: 35; 19. (386) Patrick and Aubert, *Trans. Kansas Acad. Sci.*, **19**: 19; 74. (387) Patterson, *1*, **28**: 1734; 06. (388) Paul, *9*, **23**: 65; 17. (389) Pfaundler and Schnegg, *75*, **71 II**: 351; 75.

(390) Pickering, *4*, **57**: 331; 90. (391) Pickering, *5*, **49**: 11; 91. (392) Pickering, *4*, **63**: 436; 93. (393) Pickering, *4*, **63**: 890; 93. (394) Pickering, *25*, **26**: 277; 93. (395) Pickering, *25*, **26**: 2307; 93. (396) Piña de Rubies, *149*, **38**: 414; 14. (397) Piña de Rubies, *185*, **1**: 521; 15. (398) Poggiale, *6*, **8**: 463; 43. (399) Poggiale, *49*, **44**: 273; 63.

(400) Pohl, *52*, **56**: 210; *52*. (401) Polak, *Diss.*, Amsterdam, 1914. (402) Porlezza, *22*, **23 II**: 596; 14. (402.5) Prandtl and Ducrue, *93*, **150**: 105; 26. (403) Rabe, *7*, **38**: 175; 01. (404) Ramberg, *93*, **83**: 33; 13. (405) Raupenstrauch, *57*, **6**: 563; 85. (406) Reedy, *1*, **43**: 1440; 21. (407) Reicher and Deventer, *7*, **5**: 559; 90. (408) Reissig, *13*, **127**: 33; 63. (408.5) Remy, *92*, **39**: 1061; 26. (409) Richards, *7*, **26**: 690; 98.

(410) Richards and Churchill, *7*, **28**: 313; 99. (411) Richards and Fraprie, *11*, **26**: 75; 01. (412) Richards and Kelley, *1*, **33**: 847; 11. (413) Rimbach and Korten, *93*, **52**: 406; 07. (414) Richards and Schumb, *93*, **40**: 1403; 18. (415) Richards and Wells, *7*, **43**: 465; 03. (416) Richards and Wrede, *7*, **61**: 313; 08. (417) Richards and Yngve, *1*, **40**: 89; 18. (418) Richards and Yngve, *1*, **40**: 164; 18. (419) Riedel, *7*, **56**: 243; 06.

(420) Riesenfeld and Feld, *93*, **116**: 213; 21. (421) Rimbach, *25*, **30**: 3073; 97. (422) Rimbach, *25*, **38**: 1553; 05. (423) Rimbach and Schubert, *7*, **67**: 183; 09. (424) Rivett, *4*, **121**: 379; 22. (425) Rivett and Clendinnen, *4*, **123**: 1634; 23. (426) Rodebush, *1*, **40**: 1204; 18. (427) Roelofsen, *11*, **16**: 464; 94. (428) Rogowicz, *445*, **55**: 938; 05. (429) Rosenbladt, *25*, **19**: 2535; 86.

(430) Rosenheim and Grünbaum, *93*, **61**: 187; 09. (431) Rosenheim and Krause, *93*, **118**: 177; 21. (432) Rosenheim and Reglin, *93*, **120**: 103; 21. (433) Rosenheim and Weinheber, *93*, **69**: 261; 11. (434) Rosenstiehl and Rühlmann, *Bull. soc. ind. Mulhouse*, **40**: 153; 70. (435) Ross and Jones, *1*, **47**: 2165; 25. (436) Rothmund, *7*, **69**: 523; 09. (437) Rudorff, *25*, **2**: 68; 69. (438) and (439) Rupert, *1*, **31**: 851; 09.

(440) Salkowski, *25*, **34**: 1947; 01. (441) Sborgi and Franco, *36*, **51 II**: 1; 21 (442) Scheele, *93*, **18**: 352; 98. (443) Scheffer, *64P*, **18**: 446; 16. (444) Scheibler, *49*, **8**: 540; 83. (445) Schiavon, *36*, **32 II**: 532; 02. (446) Schick, *7*, **42**: 155; 03. (447) Schiff, *13*, **109**: 325; 59. (448) Schiff, *13*, **113**: 349; 60. (448.5) Schloesing, *34*, **74**: 1552; 72. (449) Schreinemakers, *7*, **55**: 71; 06.

(450) Schreinemakers, *7*, **66**: 687; 09. (451) Schreinemakers, *7*, **69**: 557; 09. (452) Schreinemakers, *7*, **71**: 109; 10. (453) Schreinemakers, *18*, **15**: 488; 11. (454) Schreinemakers and de Baat, *18*, **15**: 80; 10. (455) Schreinemakers and de Baat, *18*, **15**: 411; 11. (456) Schreinemakers and Prooije, *64P*, **15**: 1326; 13. (457) Schreinemakers and Thonus, *64V*, **21**: 332; 12. (458) Sedlitzky, *57*, **8**: 563; 87. (459) Setterberg, *13*, **211**: 100; 82.

(460) Seubert and Eltern, *93*, **2**: 434; 92. (461) Sherrill, *7*, **43**: 705; 03. (462) Shiomi, *479*, **1**: 406; 08. (463) Sidgwick and Ewbank, *4*, **121**: 1844; 22. (464) Sidgwick and Gentle, *4*, **121**: 1837; 22. (465) Sill, *1*, **38**: 2632; 16. (466) Smith, *1*, **31**: 245; 09. (467) Smith and Ball, *1*, **39**: 217; 17. (468) Smith and Eastlack, *1*, **38**: 1261; 16. (469) Smith and Eastlack, *1*, **38**: 1500; 16.

(470) Smith and Menzies, *1*, **31**: 1183; 09. (471) Sommer, *93*, **86**: 71; 14. (472) Sommer and Weise, *93*, **94**: 51; 16. (473) Souchay and Lenssen, *13*, **99**: 31; 56. (474) Stanbridge, *4*, **113**: 808; 18. (475) Starck, *93*, **70**: 173; 11. (476) Steele and Johnson, *4*, **85**: 113; 04. (477) von Steinwehr, *8*, **9**: 1046; 02. (478) Stiassny, *57*, **12**: 589; 91. (479) Stoltzenberg, *202*, **92**: 445; 14.

(480) Stortenbeker, *7*, **22**: 60; 97. (481) Süss, *94*, **51**: 248; 12. (482) Takegami, *429*, **4**: 317; 21. (483) Takeuchi, *429*, **1**: 249; 16. (484) Tarugi and Checchi, *36*, **31 II**: 417; 01. (485) Taylor, *50*, **1**: 718; 97. (486) Taylor, *68*, **22**: 248; 98. (487) Taylor and Henderson, *1*, **37**: 1688; 15. (488) Terres and Brückner, *9*, **26**: 1; 20. (489) Terres and Brückner, *9*, **26**: 25; 20.

(490) Terres and Weiser, *9*, **27**: 177; 21. (491) Terrey and Jolly, *4*, **123**: 2217; 23. (492) Thilo, *136*, **16**: 1688; 92. (493) Thin and Cumming, *4*, **107**: 361; 15. (494) Tilden, *4*, **45**: 266; 84. (495) Tilden and Shenstone, *5*, **35**: 345; 83. *62*, **175**: 23; 85. (496) Tobler, *13*, **95**: 193; 55. (497) Toda, *429*, **4**: 305; 21. (498) Toda, *429*, **4**: 377; 21. (499) Tomula, *93*, **118**: 81; 21.

(500) Toporescu, *34*, **174**: 870; 22. (501) Toporescu, *34*, **175**: 268; 22. (502) Tourneux, *6*, **11**: 334; 19. (503) Trautz and Anschütz, *7*, **56**: 236; 06. (504) Trevor, *7*, **7**: 468; 91. (505) Trimble, *1*, **44**: 451; 21. (506) Tutton, *4*, **71**: 850; 97. (507) Tutton, *5*, **79**: 351; 07. (508) Vallance, *135*, **125**: 7; 22. (509) Vasil'ev, *53*, **42**: 570; 10.

(510) Vesterberg, *19*, **6**: No. 11: 18; 17. (511) Voermann, *176*, **2**: 766; 05. (512) Voermann, *176*, **3**: 784, 806; 06. (513) de Waal, *Diss.*, Rotterdam, 1910. (514) Wagner, *7*, **71**: 401; 10. (515) Walden, *7*, **55**: 683; 06. (516) Walker and Fyffe, *4*, **83**: 173; 03. (517) Wallace, *4*, **7**: 77; 55. (518) von Wartenberg, *13*, **440**: 97; 24. (518.5) Wells, *128*, **5**: 617; 15. (519) Wells and McAdam, *1*, **29**: 721; 07.

(520) Werner, *13*, **386**: 1; 11. (521) Werner, *25*, **44**: 2445; 11. (522) Weston, *4*, **121**: 1223; 22. (523) Whitby, *93*, **67**: 62, 107; 10. (524) Williams, Fogg and James, *1*, **47**: 297; 25. (525) Wing and Thompson, *1*, **48**: 104; 26. (526) Wirth, *93*, **76**: 174; 12. (527) Wirth, *93*, **79**: 357; 13. (528) Wirth, *93*, **87**: 9; 14. (529) Wöhler and Krupko, *25*, **46**: 2045; 13.

(530) Wolff, *93*, **45**: 89; 05. (531) van Wyk, *93*, **48**: 1; 06. (532) Young, *1*, **19** 845; 97. (533) Young and Burke, *1*, **26**: 1413; 04. (534) Young and Burke, *1*, **28**: 315; 06. (535) Zocher, *93*, **112**: 1; 20. (536) Chamberlain, Hume, Bryan and Topley, *4*, **1926**: 2620. (537) Packer and Rivett, *4*, **1926**: 1061. (538) Voskressenska, *93*, **155**: 115; 26. (539) Guigues, *345*, **34**: 210; 27. (540) Scott and Frazier, *50*, **31**: 459; 27.

# SOLUBILITY OF ORGANIC SUBSTANCES AND OF WEAK ELECTROLYTES IN WATER

NELSON W. TAYLOR

## INTRODUCTION

Throughout this section the solid phase is the unhydrated solute except where otherwise indicated.

### Symbols

$x$ Mole fraction of the unhydrated solute
$S$ Grams solute per 100 g of water
$T$ Absolute temperature, $T = 273.1 + t$
A Molal heat of solution in joules
B A numerical constant
C $\dfrac{\text{Molecular weight of solute}}{\text{Molecular weight of water}} \times \dfrac{100}{\text{n}}$
n Number of moles solute formed in solution from 1 M of the solid solute; n is usually equal to 1, but in the case of $As_2O_3$, for example, n = 2 because $As_2O_3$ + water = $2H_3AsO_3$.

For other symbols and abbreviations, *v.* p. 4.

Melting points are given in bold-face figures.

The data are presented either in the form of the constants A and B of the equation

$$\log_{10}\frac{1}{x} = \frac{0.05223\text{A}}{T} + \text{B} \qquad (1)$$

or tabulated values of $S$ for various temperatures.

## EINLEITUNG

In diesem ganzen Abschnitt ist als feste Phase der wasserfreie Stoff verstanden, wenn nichts anderes bemerkt wird.

### Zeichen

$x$ Molenbruch des gelösten wasserfreien Stoffes
$S$ Gramme des gelösten Stoffes auf 100 g Wasser
$T$ Absolute Temperatur, $T = 273{,}1 + t$
A Lösungswärme in Joule pro Mole
B Eine numerische Konstante
C $\dfrac{\text{Molekulargewicht des gelösten Stoffes}}{\text{Molekulargewicht des Wassers}} \times \dfrac{100}{\text{n}}$
n Molzahl des gelösten Stoffes, die sich aus einem Mol des löslichen Stoffes (der festen Phase) bilden. Es ist n gewöhnlich Eins, aber im Falle des $As_2O_3$ ist sie z. B. n = 2, weil $As_2O_3 + H_2O \rightarrow 2H_3AsO_3$ gibt.

Für andere Zeichen und Abkürzungen, *siehe* S. 4.

Schmelzpunkte sind durch hervorgehobene Schrift gekennzeichnet.

Die Werte sind entweder durch die Konstanten A und B der Gleichung

$$\log_{10}\frac{1}{x} = \frac{0{,}05223\text{A}}{T} + \text{B}$$

dargestellt, oder durch die tabellarische Anordnung der Werte für $S$ bei verschiedenen Temperaturen.

## INTRODUCTION

Dans cette section la phase solide est le corps dissout non hydraté à moins d'une autre indication.

### Symboles

$x$ Fraction moléculaire du corps dissout non hydraté
$S$ Grammes de corps dissout dans 100 g d'eau
$T$ Température absolue, $T = 273{,}1 + t$
A Chaleur moléculaire de dissolution en joules
B Une constante numérique
C $\dfrac{\text{Poids moléculaire du corps dissout}}{\text{Poids moléculaire de l'eau}} \times \dfrac{100}{\text{n}}$
n Nombre des molécules du corps dissout formées par la dissolution d'une molécule de corps solide; n est ordinairement égal à 1, mais dans le cas de $As_2O_3$, par exemple, n = 2 car $As_2O_3$ + eau = $2H_3AsO_3$.

Pour les autres symboles et abréviations, *v.* p. 4.

Les points de fusion sont donnés en caractères gras.

Les données sont exprimées ou sous la forme des constantes A et B de l'équation

$$\log_{10}\frac{1}{x} = \frac{0{,}05223\text{A}}{T} + \text{B} \qquad (1)$$

ou par les valeurs de $S$ disposées en tableau pour des températures variées.

## INTRODUZIONE

In tutto questo capitolo la fase solida è sempre la sostanza disciolta anidra, tranne che non sia indicato altrimenti.

### Simboli

$x$ Frazione di grammimolecola della sostanza disciolta anidra
$S$ Grammi di sostanza disciolta in 100 g di acqua
$T$ Temperatura assoluta, $T = 273{,}1 + t$
A Calore molecolare di soluzione in joule
B Costante numerica
C $\dfrac{\text{Peso molecolare della sostanza disciolta}}{\text{Peso molecolare dell'acqua}} \times \dfrac{100}{\text{n}}$
n Numero di grammimolecole di soluto formatesi in soluzione da 1 grammimolecola di sostanza solida; n è in generale eguale ad 1, tranne ad es. casi come quelli di $As_2O_3$, dove n = 2 perchè $As_2O_3$ + acqua = $2H_3AsO_3$.

Per altri simboli ed abbreviazioni, *vedi* p. 4.

I punti di fusione sono stampati in grassetto.

I dati sono riportati, o sotto forma delle costanti A e B dell' equazione:

$$\log_{10}\frac{1}{x} = \frac{0{,}05223\text{A}}{T} + \text{B} \qquad (1)$$

oppure sotto forma di tabelle con i valori di $S$, per diverse temperature.

---

To find $S$ for any temperature within the range covered by equation (1) first compute $1/x$ from that equation and then find

$$S = \frac{\text{C}}{1/x - 1} \qquad (2)$$

using the value of C given in the table.

*Example:* To find the solubility of *p*-nitrophenol at 60°,

$$\log_{10}\frac{1}{x} = \frac{0.05223 \times 16410}{273.1 + 60} - 2.186. \quad \frac{1}{x} = 2.438$$

$$S = \frac{772}{2.438 - 1} = 537 \text{ g per } 100 \text{ g } H_2O$$

In this section no A and B values are given in those cases where the experimental data could not be represented by equation (1). In such cases typical $S$ values are listed for various centigrade temperatures, $t$.

The accuracy of the data is indicated by the number of significant figures.

For solubility of alkaloids, certain organic acids and certain substituted phenols, *see* the tables at the end of this section.

Experimental results which were found to be too incomplete to be incorporated here can usually be found by reference to:

Seidell, "Solubilities of Inorganic and Organic Substances," New York, Van Nostrand, 1919.

Comey and Hahn, "A Dictionary of Chemical Solubilities," New York, Macmillan Co., 1921.

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TABLE 1

Additional data for those compounds which are starred may be found in Table 2

| Formula | Name | Range | A | B | C | Lit. |
|---|---|---|---|---|---|---|
| $SeO_2.H_2O$ | | −21 to 65 | 7 106 | −0.734 | 617.1 | (44) |
| $As_2O_3$* | | 0 to 100 | 16 470 | −0.473 | 549.3 | (1) |
| $H_3BO_3$* | | 0 to 75 | 2 125 | −1.945 | 343.2 | (48); *cf.* (26) |
| $CH_2O_2$ | Formic acid | 7.00 to 8.39 | 12 090 | −2.243 | 255.3 | (5) |
| | | 8.39 to 15.72 | 12 670 | −2.352 | 255.3 | (18) |
| $CH_3NO$ | Formamide | −45 to 2.2 | 9 150 | −1.735 | 250 | (17) |
| $C_2H_4N_4$ | Dicyanodiamide* | 0 to 75 | 31 540 | −3.455 | 466.6 | (28) |
| $C_2H_4O_2$ | Acetic acid* | −27 to 10 | 14 980 | −2.70 | 333.2 | (50); *cf.* (59) |
| $C_2H_5NO$ | Acetamide | 0 to 60 | 11 970 | −1.756 | 327.8 | (47); *cf.* (13, 73) |
| $C_3H_4O_4$ | Malonic acid* | 0 to 50 | 9 310 | −0.979 | 577 | (36, 63) |
| $C_3H_8O_3$ | Glycerol* | 18 to −1.3 | 17 150 | −3.078 | 511 | (57) |
| $C_4H_6O_4$ | Succinic acid | 0 to 75 | 32 380 | −3.778 | 655.1 | (45) |
| $C_4H_{10}O_4$ | Erythritol | 116.6 to 87.8 | 35 050 | −4.692 | 677 | (57) |
| | | 82.0 to 4 | 20 700 | −2.625 | 677 | (57) |
| $C_5H_4N_4O_3$ | Uric acid* | 15 to 100 | 26 200 | +0.502 | 933 | (6) |
| $C_6H_5ClO$ | *m*-Chlorophenol* | 32.5 to 10.8 | 16 220 | −2.778 | 712.5 | (72) |
| $C_6H_5NO_3$ | *p*-Nitrophenol* | 50 to 90 | 16 410 | −2.186 | 772 | (71) |
| $C_6H_6O_2$ | Resorcinol | 0 to 100 | 18 340 | −2.478 | 611 | (47); *cf.* (73) |
| $C_6H_{10}O_4$ | Dimethyl succinate* | 18.1 to 19.5 | 25 200 | −4.49 | 811 | (11, 12) |
| $C_6H_{12}O_6$ | *α*-Dextrose* | 50 to 90 | 18 490 | −2.204 | 1 100 | (34) |
| $C_6H_{14}O_2$ | Pinacone | 29.4 to 41.1 | 14 260 | −2.369 | 655.5 | (57) |
| $C_6H_{14}O_6$ | Mannitol* | 40 to 100 | 2 142 | −2.102 | 1 011 | (19) |
| $C_7H_5NO_4$ | *o*-Nitrobenzoic acid* | 148 to 90.6 | 26 800 | −3.322 | 929.0 | (68); *cf.* (20) |
| $C_7H_5NO_4$ | *p*-Nitrobenzoic acid* | 237.0 to 174.4 | 44 280 | −4.538 | 929 | (20); *cf.* (68) |
| $C_7H_8O$ | *p*-Cresol* | 20 to 34 | 12 380 | −2.106 | 599.8 | (71) |
| $C_7H_9N$ | *p*-Toluidine | 41.0 to 43.4 | 21 200 | −3.50 | 594.5 | (11, 12) |
| $C_8H_6O_3$ | *o*-Aldehydobenzoic acid* | 100.5 to 58.1 | 24 560 | −3.435 | 832 | (67) |
| $C_8H_6O_3$ | *m*-Aldehydobenzoic acid* | 175 to 121 | 37 420 | −4.36 | 832 | (67) |
| $C_8H_8ClNO$ | *p*-Chloroacetanilide* | 65 to 140 | 46 780 | −3.220 | 941.0 | (70) |
| $C_8H_{10}N_4O_2.H_2O$ | Caffeine | 0 to 80 | 34 900 | −3.42 | 1 077 | (80); *cf.* (39) |

TABLE 2

Additional data for those compounds which are starred may be found in Table 1

**$H_2O_2$ (42)**
C = 1885

| *t* | *S* |
|---|---|
| −54.5 | 142.8 |
| −50.0 | 170.6 |
| −32.2 | 284.5 |
| − 4 | 2960 |

**$NH_3$ (54); *cf.* (16, 60)**
C = 94.5
*v. also* p. 217

| | |
|---|---|
| −92.5E | 419 |
| −87.2 | 605 |
| −83.7 | 890 |
| −80.9 | 1690 |
| **−77.6** | ∞ |

**$As_2O_3$* (1)**
C = 549.3

| | |
|---|---|
| **0** | 1.21 |
| 25 | 2.05 |
| 98.5 | 8.18 |

**$H_3BO_3$* (48); *cf.* (26)**
C = 343.2
*v. also* p. 226

**$H_3BO_3$.—(*Cont'd*)**

| *t* | *S* |
|---|---|
| 99.5 | 29.08 |
| 108 | 58.0 |
| 115 | 81.8 |
| 120 | 110 |

**℄-Table, the ℄-arrangement $CH_2N_2$ (55)**
Cyanamide
C = 233

| | |
|---|---|
| −16.6E | 60.5 |
| **+42.9** | ∞ |

**$CH_4N_2O$ (53, 73); *cf.* (51)**
Urea
C = 333

| | |
|---|---|
| 0 | 67.1 |
| 19.8 | 97.8 |
| 31.7 | 131.3 |
| 69.5 | 252.5 |

**$CH_4N_2S$ (35)**
Thiourea
C = 423

**$CH_4N_2S$.—(*Cont'd*)**

| *t* | *S* |
|---|---|
| 56.5 | 64.4 |
| 97.2 | 239 |
| 120.6 | 485 |
| 145.0 | 1160 |

**$CH_4O$ (5)**
C = 177.6

| | |
|---|---|
| −139E | 360 |
| **− 95.7** | ∞ |

**$C_2H_2O_4$ (38); *cf.* (25, 77)**
Oxalic acid
C = 499.7
$C_2H_2O_4.2H_2O$

| | |
|---|---|
| 0 | 3.522 |
| 20 | 9.52 |
| 40 | 21.51 |
| 60 | 61.07 |

**$C_2H_3Cl_3O_2$ (73)**
Chloral hydrate
C = 918.1

| | |
|---|---|
| 0 | 189.7 |
| 15 | 330.0 |
| 30 | 480.0 |
| 35 | 516.0 |

**$C_2H_4N_4$* (28)**
Dicyanodiamide

| *t* | *S* |
|---|---|
| C = 466.6 | |
| 25 | 4.13 |
| 49.8 | 11.80 |

**$C_2H_4O_2$* (50); *cf.* (59)**
Acetic acid
C = 333.2

| | |
|---|---|
| 3.34 | 943 |
| **16. 02** | ∞ |

**$C_2H_6O$ (56)**
Ethyl alcohol
C = 255.5

| | |
|---|---|
| −118.4E | 1445 |
| **−110. 5** | ∞ |

**$C_2HCl_3O_2$ (7)**
Trichloroacrylic acid
C = 974

| | |
|---|---|
| 17E† | 430 |
| **72. 9** | ∞ |

† $C_2HCl_3O_2 + C_2HCl_3O_2.2½H_2O$.

**$C_3H_4O_4$* (36, 63)**
Malonic acid
C = 577

| | |
|---|---|
| 100 | 810 |

**$C_3H_8O_3$* (40)**
Glycerol

**$C_3H_8O_3$.—(*Cont'd*)**
C = 511

| *t* | *S* |
|---|---|
| −46.5E | 200 |
| −37.5 | 244 |
| −22.0 | 376 |
| − 1.0 | 931 |
| + 7.5 | 2028 |
| 13.5 | 5455 |
| **17. 9** | ∞ |

**$C_4H_4O_4$ (76)**
Fumaric acid
C = 650

| | |
|---|---|
| 25 | 0.70 |
| 40 | 1.07 |
| 60 | 2.4 |
| 100 | 9.8 |

**$C_4H_4O_4$ (76)**
Maleic acid
C = 650

| | |
|---|---|
| 25 | 78.8 |
| 40 | 112.5 |
| 60 | 148.7 |
| 97.5 | 392.6 |

**$C_4H_5NO_2$ (73)**
Succinimide
C = 650

| | |
|---|---|
| 0 | 10.3 |
| 20 | 26 |
| 30 | 52 |

**$C_4H_5NO_2$.—(*Cont'd*)**

| *t* | *S* |
|---|---|
| 50 | 116 |
| 80 | 213 |

**$C_4H_6O_4$ (11, 12)**
Dimethyl oxalate
C = 655

| | |
|---|---|
| 38.27 | 5 490 |
| 39.34 | 11 400 |
| 40.05 | 26 900 |

**$C_4H_6O_5$ (76)**
*dl*-Malic acid
C = 749

| | |
|---|---|
| 26 | 144.8 |
| 50 | 222.0 |
| 70 | 332.0 |
| 79 | 411.5 |

**$C_4H_6O_6$ (41)**
*d*(*l*)-Tartaric acid
C = 832

| | |
|---|---|
| 10 | 126 |
| 30 | 156 |
| 50 | 192 |
| 80 | 270 |

*dl*-Tartaric acid (41)
C = 832.8

| | |
|---|---|
| 20 | 18.0 |
| 40 | 37.0 |
| 70 | 80.6 |
| 100 | 137.8 |

$C_4H_8N_2O_3$ (10)
β-l-Asparagine
C = 744.4

| t | S |
|---|---|
| $C_4H_8N_2O_3.H_2O$ | |
| 7.9 | 1.426 |
| 28 | 3.171 |
| 41.4 | 5.650 |
| 71.7 | 19.84 |
| 98 | 52.48 |

$C_5H_4N_4O_3$* (6)
Uric acid
C = 933

| | |
|---|---|
| 0.0 | 0.002 |

$C_6H_4N_2O_5$ (64)
2, 3-Dinitrophenol
C = 1021

| | |
|---|---|
| 96.0 | 289 |
| 112.3 | 885 |
| **145.1** | ∞ |

2, 5-Dinitrophenol
C = 1021

| | |
|---|---|
| 98.0 | 3900 |
| 100.0 | 6470 |
| **105.6** | ∞ |

3, 4-Dinitrophenol
C = 1021

| | |
|---|---|
| 53.0 | 298.2 |
| 84.5 | 850.0 |
| **134.7** | ∞ |

$C_6H_5ClO$ (72)
o-Chlorophenol
C = 712.5

| | |
|---|---|
| −8.2 | 1182 |
| −6.0 | 1548 |
| −1.5 | 3015 |
| +2.0 | 6105 |
| **7.0** | ∞ |

m-Chlorophenol*
C = 712.5

| | |
|---|---|
| 3.2 | 560.5 |
| 4.5 | 680 |

p-Chlorophenol
C = 712.5

| | |
|---|---|
| 0.5 | 802 |
| 11.0 | 1711 |
| 18.0 | 3043 |
| **41.0** | ∞ |

$C_6H_5NO_3$* (71)
p-Nitrophenol
C = 772

| | |
|---|---|
| 42.3 | 314.2 |
| 43.9 | 383 |
| 62.0 | 890 |
| **113.9** | ∞ |

$C_6H_6N_2O_2$ (70)
p-Nitroaniline
C = 766

| | |
|---|---|
| 128.0 | 1529 |
| 136.8 | 2660 |
| 144.8 | 9500 |
| **147.0** | ∞ |

$C_6H_6O$ (58); *cf.* (30)
Phenol
C = 521

| t | S |
|---|---|
| 3.3 | 3230 |
| 15.8 | 1110 |
| 16.2 | 1150 |
| 29.3 | 1900 |

$C_6H_7N$ (2); *cf.* (3, 29)
Aniline
C = 516.7

| | |
|---|---|
| −11.85E | 3 783 |
| − 8.40 | 11 690 |
| − 7.55 | 20 350 |
| − 7.05 | 23 010 |
| **− 5.98** | ∞ |

$C_6H_7NO$ (66)
o-Aminophenol
C = 605

| | |
|---|---|
| 100.2 | 7.65 |
| 135.8 | 229.2 |
| 143.0 | 411 |
| 155.6 | 950 |

m-Aminophenol
C = 605

| | |
|---|---|
| 66.4 | 44.2 |
| 70.2 | 88.5 |
| 73.2 | 145.4 |
| 96.0 | 792 |

p-Aminophenol
C = 605

| | |
|---|---|
| 102.0 | 50.2 |
| 106.5 | 103.3 |
| 116.5 | 232.5 |
| 145.8 | 849 |

$C_6H_7NO_3S$ (52)
Sulfanilic acid
C = 961

| | |
|---|---|
| $C_6H_7NO_3S.2H_2O$ | |
| 0 | 0.446 |
| 13.3 | 0.848 |
| 25.1 | 1.402 |
| 47.5 | 2.585 |
| $C_6H_7NO_3S.2H_2O + C_6H_7NO_3S.H_2O$ | |
| 18.9 | 1.126 |
| $C_6H_7NO_3S.H_2O + C_6H_7NO_3S$ | |
| 44.0 | 2.46 |

$C_6H_8N_2$ (69)
o-Phenylenediamine
C = 600

| | |
|---|---|
| 67.7 | 167 |
| 80.8 | 758 |
| 88.1 | 1520 |
| 95.5 | 4285 |

m-Phenylenediamine (α-form) (69)
C = 600

| t | S |
|---|---|
| 22.7 | 229 |
| 28.7 | 379 |
| 43.5 | 1201 |
| 57.6 | 6145 |

p-Phenylenediamine (69)
C = 600

| | |
|---|---|
| 75.5 | 107.3 |
| 88.5 | 234 |
| 107 | 648 |
| 125.1 | 1915 |

$C_6H_8N_2$ (49)
Phenylhydrazine
C = 600

| | |
|---|---|
| 16.00 | 5550 |
| 16.42 | 8660 |
| **19.35** | ∞ |

$C_6H_{10}O_4$* (11, 12)
Dimethyl succinate
C = 811

| | |
|---|---|
| 15.87 | 4 690 |
| 16.82 | 7 510 |
| 17.57 | 11 820 |
| 18.02 | 16 400 |

$C_6H_{12}O_6$* (34)
α-Dextrose†
C = 1100

| | |
|---|---|
| α-$C_6H_{12}O_6.H_2O$ | |
| 0.50 | 54.3 |
| 15 | 81.68 |
| 35 | 138.2 |
| 45 | 191.6 |
| α-$C_6H_{12}O_6.H_2O$ (23) | |
| 15.00 | 81.68 |
| 22.98 | 97.51 |
| 50.00 | 243.76 |
| α-$C_6H_{12}O_6$‡ | |
| 70.2 | 359.35 |
| 90.8 | 562.25 |

† $S$ = g $C_6H_{12}O_6$/100g $H_2O$.
‡ C = 1000.

$C_6H_{14}O_6$* (9, 19)
Mannitol
C = 1011

| | |
|---|---|
| − 1.019E | 9.942 |
| 0.00 | 10.36 |
| +10.00 | 13.7 |
| 20.00 | 18.6 |
| 30.00 | 25.2 |
| 50.00 | 47.6 |
| 80.00 | 115.0 |
| 100.00 | 197.0 |

$C_7H_5NO_4$ (68); *cf.* (20)
o-Nitrobenzoic acid*
C = 929.0

| | |
|---|---|
| 49.5 | 1.88 |
| 75.3 | 10.48 |
| 78.0 | 66.5 |
| 79.5 | 149.0 |
| **146.8** | ∞ |

$C_7H_5NO_4$.—(*Cont'd*)
m-Nitrobenzoic acid (20); *cf.* (68)
C = 929

| t | S |
|---|---|
| 77.6 | 134.7 |
| 80.2 | 290.5 |
| **141.4** | ∞ |

p-Nitrobenzoic acid* (20); *cf.* (68)
C = 929

| | |
|---|---|
| 143.0 | 5.26 |
| 151.4 | 11.1 |
| 162.6 | 65.8 |
| 167.4 | 150.0 |
| 242.4 | ∞ |

$C_7H_5N_3O_6$ (75)
2, 4, 6-Trinitrotoluene
C = 1260

| | |
|---|---|
| 0 | 0.0100 |
| 15 | 0.0120 |
| 30 | 0.0175 |
| 60 | 0.0675 |
| 100 | 0.1475 |

$C_7H_5N_5O_8$ (75.5)
2, 4, 6-Trinitrophenylmethylnitroamine (tetryl)
C = 1592

| | |
|---|---|
| 0 | 0.0050 |
| 30 | 0.0085 |
| 45 | 0.0140 |
| 60 | 0.0350 |
| 100 | 0.1842 |

$C_7H_6O_2$ (65)
m-Hydroxybenzaldehyde
C = 678

| | |
|---|---|
| 43 | 2.84 |
| 60.4 | 186.5 |
| 71.2 | 499 |
| 81.1 | 808 |

p-Hydroxybenzaldehyde (65)
C = 678

| | |
|---|---|
| 63.0 | 99 |
| 64.1 | 150 |
| 69.3 | 327 |
| 83.6 | 792 |

$C_7H_6O_2$ (68); *cf.* (8)
Benzoic acid
C = 678

| | |
|---|---|
| 98.0 | 426 |
| 103.5 | 844 |
| 122.7 | ∞ |

$C_7H_6O_3$ (68); *cf.* (61)
o-Hydroxybenzoic acid
C = 767

| | |
|---|---|
| 50.0 | 0.561 |
| 101.4 | 8.72 |
| 109.5 | 189.0 |
| **159.0** | ∞ |

$C_7H_6O_3$.—(*Cont'd*)
m-Hydroxybenzoic acid (68)
C = 767

| t | S |
|---|---|
| 69.0 | 6.51 |
| 84.6 | 17.23 |
| 98.3 | 51.2 |
| 134.0 | 242.5 |
| **201.3** | ∞ |

p-Hydroxybenzoic acid (68); *cf.* (20)
C = 767

| | |
|---|---|
| 56.0 | 3.31 |
| 80.1 | 13.43 |
| 114.0 | 108.2 |
| **213.0** | ∞ |

$C_7H_7NO_2$ (20)
o-Aminobenzoic acid
C = 760.5

| | |
|---|---|
| 105.0 | 97.5 |
| 107.8 | 230 |
| 116.2 | 681 |
| 128.4 | 1900 |
| **144.6** | ∞ |

m-Aminobenzoic acid
C = 760.5

| | |
|---|---|
| 77.8 | 4.83 |
| 109.2 | 24.8 |
| 116.5 | 64.7 |
| 123.2 | 157.8 |
| 143.0 | 599.0 |
| **174.4** | ∞ |

p-Aminobenzoic acid
C = 760.5

| | |
|---|---|
| 82.2 | 5.26 |
| 94.0 | 11.1 |
| 109.0 | 42.8 |
| 123.4 | 214.3 |
| 144.8 | 733.5 |
| **186.0** | ∞ |

$C_7H_8O$ (71)
o-Cresol
C = 599.8

| | |
|---|---|
| 8.3 | 702 |
| 10.2 | 889 |
| 12.9 | 1255 |
| 22.3 | 3838 |
| **29.9** | ∞ |

p-Cresol*
C = 599.8

| | |
|---|---|
| 8.7 | 661.0 |
| 10.8 | 909.1 |

$C_8H_6O_3$ (67)
o-Aldehydobenzoic acid*
C = 832

| | |
|---|---|
| 46.1 | 10.3 |
| 49.9 | 41.2 |

$C_8H_6O_3$.—(*Cont'd*)
m-Aldehydobenzoic acid*
C = 832

| t | S |
|---|---|
| 99.7 | 5.19 |
| 110.7 | 24.75 |
| 113.5 | 67.4 |
| 116.6 | 143.0 |

p-Aldehydobenzoic acid
C = 832

| | |
|---|---|
| 142.3 | 11.4 |
| 150.9 | 23.6 |
| 158.9 | 48.0 |
| 181.5 | 98.5 |
| 191.5 | 385.0 |
| **250** | ∞ |

$C_8H_6O_4$ (43, 74)
Phthalic acid
C = 922

| | |
|---|---|
| 25 | 0.7064 |
| 45 | 1.467 |
| 65 | 3.355 |
| 85 | 8.327 |
| 95 | 21.95 |

$C_8H_8ClNO$ (70)
o-Chloroacetanilide
C = 941.0

| | |
|---|---|
| 73.0 | 1880 |
| 77.0 | 3790 |
| 82.0 | 8980 |
| **86.7** | ∞ |

m-Chloroacetanilide
C = 941.0

| | |
|---|---|
| 64.0 | 3040 |
| 69.0 | 4900 |
| **76.6** | ∞ |

p-Chloroacetanilide*
C = 941.0

| | |
|---|---|
| 168 | 3717 |

$C_8H_8N_2O_3$ (70)
p-Nitroacetanilide
C = 1000

| | |
|---|---|
| 163.6 | 450 |
| 192.2 | 1980 |
| **215.9** | ∞ |

$C_8H_8O_2$ (65)
2-Hydroxytoluene-4-aldehyde
C = 755

| | |
|---|---|
| 69.2 | 104 |
| 69.4 | 147 |
| 69.9 | 228 |
| 75.9 | 478 |

6-Hydroxytoluene-3-aldehyde
C = 755

| | |
|---|---|
| 79.6 | 149.2 |
| 80.3 | 274 |
| 91.2 | 656 |
| **117.4** | ∞ |

**$C_8H_8O_2$ (71)**
*o*-Toluic acid
C = 755

| *t* | *S* |
|---|---|
| 93.7 | 1146 |
| 94.4 | 1520 |
| 96.0 | 2370 |
| **102.4** | ∞ |

*m*-Toluic acid
C = 755

| | |
|---|---|
| 94.2 | 1225 |
| 101.9 | 3160 |
| **110.5** | ∞ |

*p*-Toluic acid
C = 755

| | |
|---|---|
| 145.1 | 392.5 |
| 156.5 | 1235 |
| **176.8** | ∞ |

**$C_8H_8O_3$ (68)**
3-Hydroxytoluene-2-carboxylic acid
C = 845

| | |
|---|---|
| 129.8 | 228.0 |
| 134.5 | 412.3 |
| 147.5 | 914.5 |
| **167.0** | ∞ |

4-Hydroxytoluene-2-carboxylic acid
C = 845

| | |
|---|---|
| 103.4 | 6.13 |
| 118.8 | 52.25 |
| 132.4 | 530.5 |
| **172.4** | ∞ |

4-Hydroxytoluene-3-carboxylic acid
C = 845

| | |
|---|---|
| 109.5 | 336.0 |
| 112.0 | 392.0 |
| 126.4 | 872.0 |
| **152.5** | ∞ |

5-Hydroxytoluene-3-carboxylic acid
C = 845

| | |
|---|---|
| 98.8 | 4.20 |
| 124.2 | 43.4 |
| 143.0 | 195.0 |
| **208.5** | ∞ |

**$C_8H_8O_3$.—(*Cont'd*)**
3-Hydroxytoluene-4-carboxylic acid
C = 845

| *t* | *S* |
|---|---|
| 132.6 | 209.7 |
| 138.3 | 392.6 |
| 147.8 | 869 |
| **177.8** | ∞ |

**$C_8H_{10}N_2O$ (69)**
*N*-Acetyl-*o*-phenylenediamine
C = 834

| | |
|---|---|
| 59.1 | 107.1 |
| 78.2 | 253.6 |
| 99 | 604 |
| 115.4 | 1376 |

*N*-Acetyl-*m*-phenylenediamine
C = 834

| | |
|---|---|
| 144.2 | 114.1 |
| 167.0 | 246 |
| 204.4 | 653 |
| 235.8 | 1610 |

*N*-Acetyl-*p*-phenylenediamine
C = 834

| | |
|---|---|
| 98.6 | 96.5 |
| 107.1 | 226 |
| 119.2 | 447 |
| 144.0 | 1610 |

**$C_8H_{10}O_2$ (11, 12)**
Veratrol
C = 766

| | |
|---|---|
| 20.12 | 8 910 |
| 20.91 | 16 120 |
| 21.25 | 22 180 |

**$C_9H_{13}O_2P$ (15)**
Mesitylene phosphinous acid (mesityl dihydroxyphosphine)
C = 1022

| | |
|---|---|
| 1 | 0.290 |
| 25 | 0.300 |
| 35 | 0.325 |
| 45 | 0.387 |
| 65 | 0.528 |
| 85 | 0.704 |

**$C_{10}H_{12}AsNO_7$ (79)**
$C_4H_4O_6(AsOH)$-$C_6H_5NH_2$
C = 1850

| *t* | *S* |
|---|---|
| 15 | 41.84 |
| 20 | 47.73 |
| 35 | 118.18 |
| 100 | 733.0 |

**$C_{10}H_{12}NO_7Sb$ (78)**
$C_4H_4O_6(SbOH)$-$C_6H_5NH_2$
C = 2100

| | |
|---|---|
| 15 | 16.59 |
| 20 | 18.10 |
| 35 | 24.39 |
| 100 | 201.8 |

**$C_{10}H_{14}O$ (62)**
Thymol
C = 834

| | |
|---|---|
| 10 | 0.067 |
| 20 | 0.088 |
| 35 | 0.126 |
| 40 | 0.141 |

**$C_{12}H_{22}O_{11}$**
Sucrose, *v.* Vol. II, p. 344

**$C_{12}H_{22}O_{11}.H_2O$ (22); *cf.* (31, 32, 33)**
Lactose
C = 2000

$\beta$-$C_{12}H_{22}O_{11}.H_2O$

| | |
|---|---|
| 0 | 12.47 |
| 39 | 33.0 |
| 89 | 146.0 |

$\alpha$-$C_{12}H_{22}O_{11}$†

| | |
|---|---|
| 121.5 | 226.5 |
| 146.2 | 366.0 |
| 178.8 | 652.5 |

† C = 1900.

**$C_{12}H_{22}O_{11}$ (24)**
Maltose
C = 1900

| | |
|---|---|
| 0.6 | 56.5 |
| 29.6 | 93.2 |
| 54.2 | 151.4 |
| 74.2 | 261.5 |
| 96.5 | 569.3 |

### Substituted Phenols in Water at 25°C

| Solid phase | Equiv. per l |
|---|---|
| Catechol | 4.19 |
| $\beta$-Naphthol | 0.00524 |
| *p*-Nitrophenol | 0.1097 |
| *m*-Nitrophenol | 0.0974 |
| Pyrogallol | 4.02 |
| Quinol | 0.666 |
| Resorcinol | 6.515 |

### Alkaloids in Water at 20°C

| Dissolved substance | Grams of anhydrous base dissolved by 100 $cm^3$ of $H_2O$ |
|---|---|
| Atropine | 0.1338 |
| Brucine | 0.0553 |
| Quinine | 0.0453 |
| Cocaine | 0.0278 |
| Codeine | 0.7893 |
| Caffeine | 1.462 |
| Coniine | 1.8280 |
| Dionine | 0.2613 |
| Eucaine-$\beta$ | 0.2964 |
| Morphine | 0.02015 |
| Narcotine | 0.00445 |
| Novocaine | 0.3325 |
| Strychnine | 0.01253 |
| Veratrine | 0.1136 |

### Organic Acids in Water at 25°C

| Solid phase | Equiv. per l |
|---|---|
| Benzilic acid | 0.00769 |
| Cinnamic acid | 0.00385 |
| Citric acid | 12.54 |
| 3, 5-Dinitrobenzoic acid | 0.00635 |
| Diphenylacetic acid | 0.00060 |
| Diphenic acid | 0.00520 |
| Diphenyleneglycollic acid | 0.01082 |
| Malonic acid | 15.01 |
| Mandelic acid | 1.191 |
| *m*-Nitrobenzoic acid | 0.0214 |
| *o*-Nitrobenzoic acid | 0.0470 |
| Oxalic acid | 2.409 |
| Phenylacetic acid | 0.1310 |
| Phthalic acid | 0.0852 |
| Picric acid | 0.0578 |
| Salicylic acid | 0.01613 |
| Styphnic acid | 0.02179 |
| Suberic acid | 0.0680 |
| Succinic acid | 1.352 |
| Tartaric acid | 10.26 |
| Trichlorolactic acid | 4.024 |

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(For a key to the periodicals see end of volume)


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# FREEZING-POINT LOWERINGS OF AQUEOUS SOLUTIONS

R. E. Hall and Miles S. Sherrill

Symbols

$N_w$ (resp. $N_v$) Number of gram-formula weights of solute per 1000 g of $H_2O$ (resp. per liter of solution)

$\Delta t$ Freezing-point lowering in °C

$\frac{\Delta t}{N}$ $\frac{\Delta t}{N_w}$ or $\frac{\Delta t}{N_v}$ = the molal freezing-point lowering

Symboles

$N_w$ (resp. $N_v$) Nombre de molécule-grammes du corps dissout dans 1000 g d'eau (resp. dans un litre de solution)

$\Delta t$ Abaissement du point de congélation en °C

$\frac{\Delta t}{N}$ $\frac{\Delta t}{N_w}$ ou $\frac{\Delta t}{N_v}$ = abaissement moléculaire du point de congélation

Zeichen

$N_w$ (bezw. $N_v$) Zahl der Gramm-formel-Gewichte des gelösten Stoffes auf 1000 g Wasser (bezw. auf 1 Liter der Lösung)

$\Delta t$ Schmelzpunktserniedrigung in °C

$\frac{\Delta t}{N}$ $\frac{\Delta t}{N_w}$ oder $\frac{\Delta t}{N_v}$ = Molekulare-Schmelzpunktserniedrigung

Simboli

$N_w$ (resp. $N_v$) Numero dei pesi corrispondenti alle formule espresse in grammi di sostanza disciolta per 1000 g di $H_2O$ (o per litro di soluzione)

$\Delta t$ Abbassamento del punto di congelamento in °C

$\frac{\Delta t}{N}$ $\frac{\Delta t}{N_w}$ o $\frac{\Delta t}{N_v}$ = abbassamento molecolare del punto di congelamento

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## INORGANIC STRONG ELECTROLYTES AND ALL SALTS

R. E. Hall

Figures having a relative significance only, are given in small type.

### Solutions of One Solute

Ā-B̄-Table

Standard arrangement (*v.* Vol. III, p. viii)

**$O_2$*: $\Delta t = 0.004°$ (227)**

* This reference does not specify pressure, although it approximated barometric pressure.

**$H_2O_2$ (164, 172, 192)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.037 | 1.9 |
| .07 | 1.86 |
| .10 | 1.84 |
| .20 | 1.84 |
| .50 | 1.86 |
| 1.0 | 1.88 |
| 2.0 | 1.91 |
| 5.0 | 1.96 |
| 10.0 | 2.03 |
| 20.0 | 2.16 |
| 24.05E* | 2.22 |

* Ice + $H_2O_2.2H_2O$ (extrap.)

**HF (5, 137, 200)**

| | |
|---|---|
| 0.025 | 2.20 |
| .04 | 2.11 |
| .07 | 2.02 |

**HF.—(*Continued*)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.10 | 1.98 |
| .20 | 1.91 |
| .40 | 1.89 |
| .70 | 1.90 |
| 1.0 | 1.93 |
| 2.0 | 2.03 |
| 4.0 | 2.18 |

**$Cl_2$ (246)**

| | |
|---|---|
| 0.01 | 4.0 |
| .015 | 3.926 |
| .02 | 3.816 |
| .03 | 3 563 |
| .05 | 3.145 |
| .08 | 2.85 |
| .069E* | 2.91 |

* Ice + $Cl_2.8H_2O$. $N_w$ is taken from Roozeboom (9); his value for $\Delta t/N$ is 3.48, which does not agree with the accurate temperature measurements of Roth.

**$ClO_2$ (29)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.076 | 2.3 |
| to | to |
| 0.405 | 1.98 |
| 0.4E* | 1.98 |

* Ice + $ClO_2.8H_2O \pm 1H_2O$.

**HCl (160, 215, 224, 236)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.001 | 3.690 |
| .002 | 3.669 |
| .005 | 3.635 |
| .01 | 3.601 |
| .02 | 3.568 |
| .05 | 3.532 |
| .10 | 3.523 |
| .20 | 3.54 |
| .50 | 3.68 |
| 1.0 | 3.94 |
| 2.0 | 4.43 |
| 4.0 | 5.65 |
| 7.0 | 8.45 |

**HCl.—(*Continued*)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 8.83E* | 9.74 |

* Ice + $HCl.3H_2O$. The value $N_w = 9.04$, given by Kremann (143) is not in agreement with the curve.

**HClO (113)**

| | |
|---|---|
| 0.2457 | 1.87 |
| .4633 | 1.88 |

**$HClO_4$ (291)**

| | |
|---|---|
| 2.373 | 4.21 |
| 4.178 | 5.02 |
| 5.490 | 6.28 |
| 6.861 | 7.87 |
| 7.072E* | 8.13 |

* Ice + $Mix_{II}$.

**$Br_2$ (246)**

| | |
|---|---|
| 0.006 | 2.02 |
| .01 | 1.95 |
| .02 | 1.90 |
| .05 | 1.875 |
| .10 | 1.870 |
| .162 | 1.865 |
| .139E* | 1.868 |

* Ice + $Br_2.10H_2O$. $N_w$ is taken from Roozeboom (9, 10, 11); his value for $\Delta t/N$ is 2.16, which does not agree with the accurate temperature measurements of Roth.

**HBr (125, 214)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.10 | 3.70 |
| .20 | 3.55 |
| .40 | 3.60 |
| .70 | 3.78 |
| 1.0 | 4.0 |
| 2.0 | 4.8 |
| 4.0 | 6.5 |
| 6.88 | 9.4 |

**$I_2$ (246)**

| | |
|---|---|
| 0.00074 | 2.0 |

**HI (140, 193, 216)**

| | |
|---|---|
| 0.1 | 3.50 |
| .2 | 3.56 |
| .4 | 3.70 |
| .7 | 3.88 |
| 1.0 | 4.09 |
| 2.0 | 4.75 |
| 4.0 | 6.55 |
| 5.0 | 7.70 |
| 7.63E* | 10.5 |

* Ice + $HI.4H_2O$. Considerable uncertainty.

**$HIO_3$ (84)**

| | |
|---|---|
| 0.03 | 3.24 |
| .05 | 3.12 |
| .10 | 2.95 |
| .20 | 2.71 |
| .50 | 2.21 |
| 1.0 | 1.72 |

**$HIO_3$.—(*Continued*)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 2.0 | 1.16 |
| 5.0 | 0.75 |
| 7.5 | 0.70 |
| 10.0 | 0.75 |
| 14.0 | 0.88 |
| 15.24E* | 0.92 |

* Ice + $HIO_3$(extrap.).

**$HIO_4$ (47)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.20 | 2.18 |
| .30 | 2.15 |
| .50 | 2.12 |
| .75 | 2.13 |
| 1.0 | 2.15 |

**$H_2SO_3$ (7, 226)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.1 | 2.8 |
| .2 | 2.6 |
| .4 | 2.45 |
| .7 | 2.38 |
| 1.0 | 2.35 |

According to Roozeboom (11), the eutectic (ice + $H_2SO_3.6H_2O$) is located at $N_w = 1.4$, and $\Delta t/N = 1.86$. Guthrie (92) gives $\Delta t = 1.5$. No agreement exists.

**$H_2SO_4$ (13, 20, 100, 119, 159, 187, 206, 210, 211, 217, 244); *cf.* (298)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.0025 | 5.052 |
| .005 | 4.814 |
| .01 | 4.584 |
| .025 | 4.300 |
| .05 | 4.112 |
| .10 | 3.940 |
| .20 | 3.790 |
| .40 | 3.68 |
| .70 | 3.77 |
| 1.0 | 4.04 |
| 2.0 | 5.07 |
| 4.0 | 7.05 |
| 6.25E* | 12.0 |

* Ice + $H_2SO_4.4H_2O$.

**$H_2S_2O_6$ (47)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.04 | 5.12 |
| .05 | 5.06 |
| .075 | 5.00 |
| .10 | 5.04 |
| .20 | 5.14 |

**$H_2SeO_3$ (47)**

| | |
|---|---|
| 0.2 | 2.12 |
| .3 | 2.08 |
| .5 | 2.01 |
| .75 | 1.96 |
| 1.0 | 1.93 |

**$H_2SeO_4$ (148, 226)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.2 | 3.88 |
| .4 | 4.24 |
| .7 | 4.70 |
| 1.0 | 5.06 |
| 2.0 | 6.00 |
| 4.0 | 7.96 |
| 6.36E* | 13.05 |

* Ice + $H_2SeO_4.4H_2O$ (extrap.).

**$H_2TeO_4$ (86, 183)**

| | |
|---|---|
| 0.0725 | 2.1 |
| .100 | 1.9 |
| .189 | 2.0 |
| .772E* | 1.94 |

* $H_2TeO_4.6H_2O$.

**$N_2O$* (78, 244)**

| | |
|---|---|
| 0.0564 | 1.9 |

* This value (244) is based on 760 mm pressure. The other reference does not specify pressure, although it approximated barometric pressure.

**$NH_3$* (252)**

*v. also* $NH_4OH$

| | |
|---|---|
| 0.6 | 2.0 |
| 1.0 | 1.94 |
| 2.0 | 1.94 |
| 5.0 | 2.06 |
| 10.0 | 2.26 |
| 20.0 | 2.90 |

**$NH_3$.—(*Continued*)**

| | |
|---|---|
| 27.6 | 3.56 |

*E: Ice + $NH_3.H_2O$. According to Rupert (252), the eutectic lies below $\Delta t = 120$. According to Postma (219), it lies at $N_w = 29.24$ and $\Delta t = 100.3°$.

**$HNO_3$ (119, 153, 161, 187, 245)**

| | |
|---|---|
| 0.005 | 3.67 |
| .01 | 3.64 |
| .02 | 3.61 |
| .05 | 3.55 |
| .10 | 3.51 |
| .20 | 3.47 |
| .40 | 3.46 |
| .70 | 3.51 |
| 1.0 | 3.58 |
| 2.0 | 3.79 |
| 4.0 | 4.16 |
| 7.67E* | 5.64 |

* Ice + $HNO_3.3H_2O$.

**$NH_4OH$ (119)**

| | |
|---|---|
| 0.006 | 2.11 |
| .01 | 2.03 |
| .02 | 1.97 |
| .05 | 1.96 |

**$NH_4NO_2$ (229)**

**$NH_4NO_3$ (160, 187, 235)**

| | |
|---|---|
| 0.01 | 3.572 |
| .02 | 3.535 |
| .05 | 3.470 |
| .10 | 3.396 |
| .20 | 3.296 |
| .50 | 3.11 |
| 1.0 | 2.92 |
| 2.0 | 2.65 |
| 5.0 | 2.17 |
| 9.344E* | 1.784 |

* Ice + $NH_4NO_3$ (rhombic $\beta$).

**$NH_4Cl$ (23, 117, 160, 161, 187, 235)**

| | |
|---|---|
| 0.005 | 3.617 |
| .006 | 3.608 |
| .01 | 3.582 |
| .02 | 3.544 |
| .05 | 3.489 |
| .10 | 3.442 |
| .20 | 3.392 |
| .30 | 3.362 |
| .50 | 3.34 |
| 1.0 | 3.33 |
| 2.0 | 3.34 |
| 3.0 | 3.345 |
| 4.0 | 3.35 |
| 4.58E* | 3.354 |

* Ice + $NH_4Cl$.

**$NH_4I$ (88)**

| | |
|---|---|
| 8.62E* | 3.19 |

* Ice + $NH_4I$.

**$NH_2SO_3H.NH_2OH$ (253)**

**$N_2H_6SO_4$ (266)**

Hydrazine sulfate

**$(NH_4)_2SO_4$ (235)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 2.0 | 3.21 |
| 3.0 | 3.34 |
| 4.0 | 3.50 |
| 5.025E* | 3.65 |

* Ice + $(NH_4)_2SO_4$.

**$(NH_4)_2S_2O_8$ (182)**

**$(NH_2OH)_2.H_2S_2O_6$ (253)**

**$(N_2H_5)_2SO_4$ (266)**

Hydrazine sulfate

**$HPO_3$ (47, 107)**

**$H_3PO_3$ (7, 226)**

**$H_3PO_2$ (205)**

| | |
|---|---|
| 0.1 | 2.94 |
| .2 | 2.80 |
| .5 | 2.59 |
| 1.0 | 2.46 |

**$H_3PO_4$ (81, 119, 125, 160, 226, 240)**

| | |
|---|---|
| 0.005 | 3.1 |
| .01 | 2.95 |
| .02 | 2.75 |
| .04 | 2.57 |
| .07 | 2.44 |
| .10 | 2.36 |
| .20 | 2.23 |
| .40 | 2.13 |
| .70 | 2.11 |
| 1.0 | 2.14 |
| 2.0 | 2.41 |
| 4.0 | 2.94 |
| 7.0 | 3.5 |
| 10.0 | 4.0 |
| 17.0E* | 5.0 |

* Ice + $2H_3PO_4.H_2O$.

**$H_4P_2O_6$ (45, 47)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.05 | 3.94 |
| .075 | 3.74 |
| .10 | 3.63 |
| .20 | 3.38 |
| .50 | 3.19 |
| .60 | 3.18 |

**$H_4P_2O_7$ (47, 81)**

| | |
|---|---|
| 0.10 | 3.80 |
| .20 | 3.59 |
| .30 | 3.46 |
| $N_w$ | $\Delta t/N$ |
| 8.08E* | 9.28 |

* Ice+$H_4P_2O_7.1.5H_2O$.

**$NH_2OH.H_3PO_2$ (253)**

**$NH_2PO(OH)_2.NH_2OH$ (253)**

**$(NH_4PO_3)_2$ (114, 253)**

**$(NH_2OH)_2.H_4P_2O_6$ (253)**

**$H_3AsO_3$ (92)**

Eutectic: $\Delta t = 0.5$

**$H_3AsO_4$ (173)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 2.0 | 2.34 |
| 4.0 | 2.89 |
| 7.0 | 3.41 |
| 10.0 | 3.67 |

**$H_3AsO_4$.—(*Cont'd*)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 12.5 | 3.78 |
| 15.5E* | 3.85 |

* Ice + $2H_3AsO_4.H_2O$ (extrap.).

**CO*: $\Delta t = 0.015°$ (68)**

* Pressure = *ca.* 1 atm.

**$CO_2$ (78)**

| | |
|---|---|
| 0.05 to 0.08 | 2.1 to 2.2 |

**$C_5H_{11}HSO_4$ (37)**

**$NH_4C_2H_3O_2$ (139)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.01 | 3.6 |
| .02 | 3.57 |
| .05 | 3.55 |
| .10 | 3.54 |
| .20 | 3.54 |
| .50 | 3.55 |

**$(NH_4)_2C_2O_4$ (89)**

E: $N_w = 0.232$

$\Delta t = 0.2°$

**$N(CH_3)_4NO_2$ (229)**

**$(NH_4)_3C_6H_5O_7$ (232)**

Citrate

**$N(C_3H_7)_4NO_3$ (273)**

Tetrapropylammonium nitrate

**$(C_2H_5)_3NHCl$**

**$(C_2H_5)_3NHBr$**

**$(C_2H_5)_3NHI$**

Triethylammonium halides (273).

**$NH_4CNS$ (251, 276)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.7 | 3.24 |
| 1.0 | 3.23 |
| 2.0 | 3.17 |
| 4.0 | 3.06 |
| 7.0 | 2.86 |
| 9.38E* | 2.69 |

* Ice + $NH_4CNS$.

**$C_5H_{11}NH_4SO_4$ (37)**

**$AsO_4H_3.2C_6H_5NH_2$ (198)**

**$H_2SiF_6$ (226)**

| | |
|---|---|
| 0.189 | 4.56 |

**$Zr(SO_4)_2$ (39)**

**$SnCl_4$ (161)**

| | |
|---|---|
| 0.01 | 12.6 |
| .02 | 12.43 |
| .04 | 12.18 |
| .07 | 11.84 |
| .10 | 11.42 |
| .20 | 9.78 |

**$PbCl_2$ (71)**

**$Pb(NO_3)_2$ (43, 100, 187, 217, 224)**

| | |
|---|---|
| 0.001 | 5.368 |
| .002 | 5.272 |
| .005 | 5.090 |
| .01 | 4.898 |

**$Pb(NO_3)_2$.—(*Cont'd*)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.02 | 4.657 |
| .05 | 4.276 |
| .10 | 3.955 |
| .20 | 3.560 |
| .50 | 2.940 |
| 1.00 | 2.435 |
| 1.061E* | 2.4 |

* Ice + $Pb(NO_3)_2$.

**$Pb(C_2H_3O_2)_2$ (92, 131)**

| | |
|---|---|
| 0.03 | 4.3 |
| .05 | 3.63 |
| .10 | 2.85 |
| .20 | 2.37 |
| .40 | 2.15 |
| .674E* | 2.08 |

* Ice + $Pb(C_2H_3O_2)_2.3(?)H_2O$.

**TlCl (224)**

| | |
|---|---|
| 0.0008 | 3.69 |
| .001 | 3.685 |
| .002 | 3.665 |
| .004 | 3.641 |
| .006 | 3.626 |

**$Tl_2SO_4$ (61)**

| | |
|---|---|
| 0.02 | 4.22 |
| .03 | 4.00 |
| .05 | 3.81 |

**$TlHSO_4$ (61)**

| | |
|---|---|
| 0.01 | 4.31 |
| .02 | 4.20 |
| .04 | 4.03 |
| .07 | 3.82 |
| .1015 | 3.71 |

**$TlNO_3$ (62)**

| | |
|---|---|
| 0.02 | 3.49 |
| .04 | 3.36 |
| .07 | 3.25 |
| .10 | 3.18 |
| .14 | 3.11 |

**$TlHC_2O_4$ (61)**

| | |
|---|---|
| 0.0154 | 3.57 |
| .02 | 3.55 |
| .04 | 3.42 |
| .0619 | 3.31 |

**$ZnCl_2$ (23, 118, 184, 187)**

| | |
|---|---|
| 0.0025 | 5.41 |
| .005 | 5.28 |
| .01 | 5.15 |
| .02 | 5.04 |
| .04 | 4.96 |
| .07 | 4.94 |
| .10 | 4.94 |
| .20 | 4.96 |
| .40 | 5.03 |
| .70 | 5.11 |
| 1.00 | 5.21 |
| 2.00 | 5.49 |
| 4.00 | 5.94 |
| 6.00 | 6.53 |
| 7.64E* | 8.12 |

* Ice + $ZnCl_2.4H_2O$ (approx.).

**$Zn(ClO_3)_2$ (174)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 1.555 | 5.79 |
| 1.87 | 6.95 |

**$ZnSO_4$ (42, 43, 44, 77, 100, 132, 187, 226)**

| | |
|---|---|
| 0.0025 | 3.094 |
| .004 | 2.993 |
| .007 | 2.874 |
| .01 | 2.80 |
| .02 | 2.65 |
| .04 | 2.49 |
| .07 | 2.37 |
| .10 | 2.29 |
| .20 | 2.12 |
| .40 | 1.95 |
| .70 | 1.84 |
| 1.0 | 1.87 |
| 1.5 | 2.07 |
| 2.314E* | 2.83 |

* Ice + $ZnSO_4.7H_2O$.

**$Zn(NO_3)_2$ (77, 125 251)**

| | |
|---|---|
| 0.07 | 4.92 |
| .10 | 4.89 |
| .20 | 4.89 |
| .40 | 5.03 |
| .70 | 5.40 |
| 1.0 | 5.83 |
| 2.0 | 7.12 |
| 3.43E* | 8.45 |

* Ice+$Zn(NO_3)_2.9H_2O$ (interp.).

**$ZnC_2H_2O_4$ (35)**

Formate

**$ZnC_4H_2O_4$ (35)**

Maleate

**$Zn(C_2H_3O_2)_2$ (35, 83, 92)**

| | |
|---|---|
| 0.06 | 4.9 |
| .10 | 4.74 |
| .20 | 4.37 |
| .26 | 4.21 |
| 1.628E* | 3.62 |

* Ice + $Zn(C_2H_3O_2)_2.3(?)H_2O$.

**$CdCl_2$ (118, 138, 187)**

| | |
|---|---|
| 0.005 | 4.79 |
| .01 | 4.71 |
| .025 | 4.42 |
| .05 | 4.12 |
| .10 | 3.84 |
| .20 | 3.57 |
| .50 | 3.24 |

**$Cd(ClO_3)_2$ (174)**

| | |
|---|---|
| 1.27 | 5.1 |
| 3.935 | 3.3 |

**$CdBr_2$ (118, 187)**

| | |
|---|---|
| 0.005 | 4.76 |
| .01 | 4.47 |
| .025 | 4.03 |
| .05 | 3.65 |
| .10 | 3.22 |

**$CdI_2$** (118, 125, 145, 187, 251)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.005 | 4.06 |
| .01 | 3.86 |
| .025 | 3.34 |
| .05 | 2.69 |
| .10 | 2.27 |
| .20 | 2.1 |
| .50 | 2.1 |
| 1.0 | 2.25 |
| 1.5 | 2.60 |
| 2.1E* | 3.57 |

* Ice + $CdI_2$ (extrap.).

**$CdSO_4$** (100, 132, 187)

| | |
|---|---|
| 0.0025 | 3.080 |
| .005 | 2.916 |
| .01 | 2.744 |
| .025 | 2.496 |
| .05 | 2.3 |
| .10 | 2.1 |
| .20 | 1.93 |
| .40 | 1.80 |
| .70 | 1.76 |
| 1.0 | 1.79 |
| 1.25 | 1.86 |

**$Cd(NO_3)_2$** (77, 118, 125, 187, 251)

| | |
|---|---|
| 0.0025 | 5.38 |
| .003 | 5.35 |
| .005 | 5.28 |
| .01 | 5.20 |
| .02 | 5.15 |
| .04 | 5.12 |
| .07 | 5.09 |
| .10 | 5.08 |
| .20 | 5.08 |
| .40 | 5.13 |
| .70 | 5.25 |
| 1.0 | 5.42 |
| 2.0 | 6.2 |
| 2.41E* | 6.64 |

* Ice + $Cd(NO_3)_2.9H_2O$.

**$Cd(C_2H_3O_2)_2$** (35)

| | |
|---|---|
| 0.03 | 5.08 |
| .05 | 4.69 |
| .10 | 4.15 |
| .20 | 3.71 |
| .30 | 3.54 |

**$HgCl_2$** (23, 89)

| | |
|---|---|
| 0.019–0.092 | 1.8 |
| .125E* | 1.6 |

* Ice + $HgCl_2$.

**$Hg(NO_2)_2$** (229)

**$Hg(CN)_2$** (92, 222)

| | |
|---|---|
| 0.05–0.085 | 1.9–2.0 |
| .319E* | 1.41 |

* Ice + $Hg(CN)_2$.

**$CuCl_2$** (23, 250)

| | |
|---|---|
| 0.035 | 4.89 |
| .05 | 4.86 |
| .10 | 4.81 |
| .20 | 4.83 |
| .40 | 4.96 |
| .70 | 5.30 |

**$CuCl_2$**.—(*Cont'd*)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 1.0 | 5.70 |
| 2.0 | 6.95 |
| 3.0 | 8.0 |
| 4.4E* | 9.0 |

* Ice + $CuCl_2.2H_2O$. Value uncertain due to long extrap.

**$Cu(ClO_3)_2$** (174)

| | |
|---|---|
| 1.907 | 6.29 |
| 2.790 | 8.96 |

**$CuBr_2$** (23)

| | |
|---|---|
| 0.025 | 5.13 |
| .05 | 5.10 |
| .10 | 5.13 |
| .20 | 5.23 |
| .40 | 5.53 |
| .60 | 5.89 |

**$CuSO_4$** (20, 43, 44, 100, 187, 233)

| | |
|---|---|
| 0.0025 | 3.003 |
| .003 | 2.972 |
| .005 | 2.871 |
| .01 | 2.703 |
| .025 | 2.448 |
| .05 | 2.266 |
| .10 | 2.085 |
| .20 | 1.912 |
| .50 | 1.722 |
| .70 | 1.690 |
| .80 | 1.690 |
| 1.00 | 1.715 |
| 0.846E* | 1.692 |

* Ice + $CuSO_4.5H_2O$.

**$Cu(NO_3)_2$** (77, 125, 251)

| | |
|---|---|
| 0.07 | 5.3 |
| .10 | 5.1 |
| .20 | 5.0 |
| .40 | 5.1 |
| .70 | 5.4 |
| 1.0 | 5.7 |
| 2.0 | 6.7 |
| 3.0E* | 8.0 |

* Ice + $Cu(NO_3)_2.9H_2O$ (extrap.).

**$Cu(HCO_2)_2$** (35)

**$Cu(C_2H_3O_2)_2$** (35)

| | |
|---|---|
| 0.06 | 3.50 |
| .10 | 3.36 |
| .20 | 3.13 |
| .254 | 3.03 |

**Cu**, Propionate; *n*-Butyrate; Lactate; Malate (35)

**$NH_4Cu(CN)_2$** (85)

**$NH_4Cu(CN)_3$** (85)

**Cu**, Complexes of amino acids (142)

**Pt**, ammines (204)

**$AgNO_3$** (179, 226, 242)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.01 | 3.60 |
| .02 | 3.54 |
| .05 | 3.42 |

**$AgNO_3$**.—(*Cont'd*)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.10 | 3.32 |
| .20 | 3.20 |
| .50 | 2.96 |
| 1.0 | 2.63 |
| 2.0 | 2.16 |
| 3.0 | 1.85 |
| 5.24E* | 1.393 |

* Ice + $AgNO_3$ (rhombic).

**$MnCl_2$** (23, 250)

| | |
|---|---|
| 0.04 | 4.9 |
| .07 | 4.86 |
| .10 | 4.86 |
| .20 | 4.90 |
| .40 | 5.10 |
| .70 | 5.54 |
| 1.0 | 6.05 |
| 1.63 | 7.4 |

**$MnSO_4$** (50, 132, 251)

| | |
|---|---|
| 0.126 | 2.28 |
| 0.2 | 2.14 |
| 0.4 | 1.99 |
| 0.7 | 1.95 |
| 1.0 | 2.02 |
| 2.0 | 2.5 |
| 3.15E* | 3.34 |

* Ice + $MnSO_4.7H_2O$.

**$Mn(NO_3)_2$** (77, 125, 251)

| | |
|---|---|
| 0.2 | 4.92 |
| .4 | 5.34 |
| .7 | 5.74 |
| 1.0 | 6.00 |
| 2.0 | 6.64 |
| 4.05E* | 7.7 |

* Ice + $Mn(NO_3)_2.6H_2O$ (extrap.).

**$FeF_3$** (203)

| | |
|---|---|
| 0.085 | 1.90 |
| .171 | 1.88 |

**$FeCl_2$** (23)

| | |
|---|---|
| 0.025 | 5.22 |
| .04 | 5.15 |
| .07 | 5.13 |
| .10 | 5.12 |
| .20 | 5.16 |
| .40 | 5.43 |

**$FeCl_3$** (12, 203)

| | |
|---|---|
| 0.02 | 6.93 |
| .05 | 6.28 |
| .10 | 6.01 |
| .20 | 6.02 |
| .50 | 6.55 |
| 1.0 | 8.18 |
| 1.5 | 10.30 |
| 2.0 | 12.45 |
| 2.63 | 15.2 |
| 3.05E* | 18 |

* Ice + $FeCl_3.6H_2O$.

**$FeSO_4$** (75)

| | |
|---|---|
| 0.07 | 2.555 |
| .10 | 2.39 |
| .20 | 2.10 |
| .40 | 1.87 |

**$FeSO_4$**.—(*Cont'd*)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.70 | 1.80 |
| .80 | 1.81 |
| .983E* | 1.856 |

* Ice + $FeSO_4.7H_2O$.

**$Fe(NO_3)_2$** (77)

| | |
|---|---|
| 2.35 | 6.16 |
| 2.66 | 7.14 |
| 2.78 | 7.56 |
| 3.06E* | 9.15 |

* Ice + $Fe(NO_3)_2.9H_2O$.

**$Fe(NO_3)_3$** (125)

| | |
|---|---|
| 0.07 | 6.37 |
| .10 | 6.30 |
| .20 | 6.48 |
| .40 | 7.08 |
| .70 | 8.10 |
| 1.0 | 9.4 |
| 1.65 | 13.0 |

**$Fe(NH_4)_2(SO_4)_2$** (138)

**$Fe_2(NH_4)_2(SO_4)_4$** (127)

**$Fe_2(C_2O_4)_3$** (256)

**$Fe_2(C_2H_3O_2)_5OH$** (239)

**$Fe(C_2H_3O_2)_2Cl$** (239)

**$Fe(C_2H_3O_2)_2Br$** (239)

**$(NH_4)_3Fe(C_2O_4)_3$** (138)

**$(NH_4)_2[Fe(CN)_5NO]$** (33)

**$CoCl_2$** (93, 145, 251)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.002 | 5.35 |
| .005 | 5.208 |
| .010 | 5.107 |
| .025 | 4.989 |
| .05 | 4.918 |
| .10 | 4.882 |
| .15 | 4.900 |
| .20 | 4.946 |
| .25 | 4.997 |
| .40 | 5.170 |
| .70 | 5.67 |
| 1.0 | 6.31 |
| 1.5 | 7.48 |
| 2.0 | 8.51 |
| 2.43E* | 9.26 |

* Ice + $CoCl_2.6H_2O$ (extrap.).

**$Co(ClO_3)_2$** (174)

| | |
|---|---|
| 1.894 | 6.34 |
| 2.645 | 8.32 |

**$Co(ClO_4)_2$** (82)

| | |
|---|---|
| 1.265 | 8.6 |
| 1.625 | 13.1 |
| 2.248 | 13.7 |

$E^*$: $\Delta t = 62.2°$

* Ice + $Co(ClO_4)_2.9H_2O$.

**$CoBr_2$** (109)

| | |
|---|---|
| 0.12 | 5.05 |
| .20 | 5.07 |
| .34 | 5.37 |

**$CoSO_4$** (132)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.094 | 2.22 |
| .20 | 2.02 |
| .50 | 1.75 |
| .70 | 1.70 |
| .91 | 1.74 |

**$Co(NO_3)_2$** (125)

| | |
|---|---|
| 0.1 | 4.6 |
| .2 | 4.5 |
| .4 | 4.7 |
| .7 | 5.1 |
| 1.0 | 5.5 |

(77, 145)

| | |
|---|---|
| 2.29 | 6.13 |
| 2.67 | 6.73 |
| 3.12 | 7.05 |
| 3.57E* | 7.29 |

* Ice + $Co(NO_3)_2.9H_2O$.

**$Co(NH_3)_3.(NO_2)_3$** (97)

| | |
|---|---|
| 0.002 | 1.87 |

**$Co(NH_3)_2.(NO_2)_4.NH_4$** (97)

**$Co(NH_3)_4.(NO_2)_2.NO_2$** (97)

**$Co(NH_3)_5.Cl.Cl_2$** (97)

**$Co(NH_3)_6Cl_3$** (97)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.002 | 6.495 |
| .005 | 6.180 |
| .010 | 6.435 |
| .016 | 5.765 |

**$Co(NH_3)_4.(NO_2)_2.Cl$** (97)

| | |
|---|---|
| 0.002 | 3.66 |
| .005 | 3.622 |
| .01 | 3.590 |
| .02 | 3.556 |

**$Co(NH_3)_5.NO_2.Cl_2$** (97)

| | |
|---|---|
| 0.002 | 5.26 |
| .005 | 5.123 |
| .010 | 4.989 |

**Co**, Ammines of other types (204, 285, 286)

**$Co(C_2H_3O_2)_2$** (35)

| | |
|---|---|
| 0.06 | 5.00 |
| .10 | 4.58 |
| .20 | 4.37 |
| .25 | 4.36 |

**$Co(CNS)_2$** (96)

| | |
|---|---|
| 0.046 | 4.74 |
| .07 | 4.19 |
| .10 | 3.73 |
| .15 | 3.46 |
| .229 | 3.35 |

**$NiCl_2$** (23, 92, 251)

| | |
|---|---|
| 0.02 | 5.58 |
| .05 | 5.41 |
| .10 | 5.38 |
| .20 | 5.43 |

**$NiCl_2$**.—(*Continued*)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.50 | 5.69 |
| 1.0 | 6.22 |
| 1.5 | 7.34 |
| 2.0 | 8.67 |

$E^*$: $\Delta t = 10.35°$

* Ice + $NiCl_2.(?)H_2O$.

**$Ni(ClO_3)_2$** (174)

| | |
|---|---|
| 1.606 | 5.60 |
| 2.067 | 6.53 |

**$Ni(ClO_4)_2$** (82)

| | |
|---|---|
| 1.283 | 8.5 |
| 1.809 | 11.8 |
| 2.710 | 11.3 |

$E^*$: $\Delta t = 49.0°$

* Ice + $Ni(ClO_4)_2.9H_2O$.

**$NiSO_4$** (100, 132, 187, 268)

| | |
|---|---|
| 0.0025 | 3.220 |
| .003 | 3.192 |
| .005 | 3.036 |
| .01 | 2.832 |
| .02 | 2.63 |
| .05 | 2.37 |
| .10 | 2.20 |
| .20 | 2.05 |
| .40 | 1.95 |
| .70 | 1.92 |
| 1.0 | 1.94 |
| 1.676E* | 2.48 |

* Ice + $NiSO_4.7H_2O$ (extrap.).

**$Ni(NO_3)_2$** (125, 251)

| | |
|---|---|
| 0.08 | 4.92 |
| .10 | 4.91 |
| .20 | 4.91 |
| .40 | 5.04 |
| .70 | 5.38 |
| 1.0 | 5.86 |
| 1.3 | 6.34 |

(77, 145)

| | |
|---|---|
| 2.42 | 6.2 |
| 2.77 | 6.68 |
| 3.26 | 7.06 |
| 3.46E* | 7.8 |

* Ice + $Ni(NO_3)_2.9H_2O$ (extrap.). These sets of data are not in agreement.

**$Ni(N_2H_4)(H_2O)_3SO_4$** (266)

Hydrazineato-triaquo nickel sulfate

**$Ni(C_2H_3O_2)_2$** (35)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.04 | 5.1 |
| .05 | 4.92 |
| .10 | 4.62 |
| .20 | 4.48 |

**$(NH_4)_2(COS)_4Ni$** (234)

**$CrO_3$ (32, 146)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.2 | 2.3 |
| .4 | 2.2 |
| .7 | 2.34 |
| 1.0 | 2.50 |
| 2.0 | 2.94 |
| 4.0 | 3.52 |
| 7.0 | 4.06 |
| 10.0 | 4.56 |
| 13.36E* | 7.8 |
| 15.32E† | 10.11 |

* Ice + $CrO_3$ (extrap.) (146).
† (32).

**$CrCl_2$ (141)**

**$Cr_2(SO_4)_3$ (127)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.025 | 4.8 |
| .05 | 4.6 |
| .10 | 4.2 |
| .25 | 4.1 |

**$Cr(NH_3)_6Br_3$ (204)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.015 | 6.34 |
| .02 | 6.16 |
| .03 | 5.88 |
| .05 | 5.52 |
| .10 | 5.03 |

**$CrNH_4(SO_4)_2$ (127)**

**$(N_2H_5)_2Cr(SO_4)_2 \cdot 12H_2O$ (266)**

Hydrazine chromium sulfate

**Cr**, Acetates, complex (283)

**Cr**, Ammines (204, 207, 284)

**$Cr(C_2H_4N_2H_4)_3Cl_3$ (207)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.03 | 5.27 |
| .05 | 5.01 |
| .10 | 4.49 |

**$MoO_3$ (238)**

**$Mo_3O_8$ (168)**

**$Mo(OH)_2Cl_2$ (274)**

**$(NH_4)_2Mo_2O_8$ (182)**

**$MoO_2.(OCH_3)_2$ (238)**

**$(WO_3)_4.H_2O$ (257)**

**$H_3PO_4.12WO_3$ (257)**

**$UO_2Cl_2$ (56)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.03 | 5.37 |
| .05 | 5.23 |
| .10 | 5.03 |
| .30 | 4.87 |
| .60 | 4.84 |

**$UO_2SO_4$ (56)**

| | |
|---|---|
| 0.03 | 2.35 |
| .05 | 2.20 |
| .10 | 2.00 |
| .30 | 1.72 |
| .60 | 1.58 |

**$UO_2(NO_3)_2$ (56, 277)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.03 | 5.32 |
| .05 | 5.16 |
| .10 | 5.00 |
| .20 | 4.92 |
| .40 | 5.08 |
| .70 | 5.58 |
| 1.00 | 6.15 |
| 1.50 | 7.40 |
| 1.923E* | 9.41 |

* Ice + $UO_2(NO_3)_2 \cdot 6H_2O$.

**$UO_2C_4H_4O_6$ (56)**

| | |
|---|---|
| 0.0643 | 1.9 |

**$UO_2(C_2H_3O_2)_2$ (56)**

| | |
|---|---|
| 0.015 | 3.73 |
| .03 | 3.23 |
| .07 | 2.69 |
| .13 | 2.32 |

**$UO_2(CNS)_2$ (197)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.122 | 4.62 |

**$VCl_3$ (209)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.02 | 9.35 |
| .04 | 8.77 |
| .07 | 8.68 |
| .10 | 8.68 |
| .20 | 8.88 |
| .26 | 9.31 |

**$HBO_2$ (134)**

**$H_3BO_3$ (47, 134, 186)**

| | |
|---|---|
| 0.10 | 2.0 |
| .20 | 1.92 |
| .30 | 1.94 |
| .376E* | 2.02 |

* Ice + $H_3BO_3$.

**$H_2B_4O_7$ (134)**

**$AlCl_3$ (125)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.01 | 7.10 |
| .02 | 6.62 |
| .05 | 6.02 |
| .10 | 5.68 |
| .20 | 5.76 |
| .30 | 6.14 |
| .50 | 7.06 |
| 1.00 | 9.45 |
| 2.12 | 21.2 |

**$Al(ClO_3)_3$ (243)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.013 | 5.970 |
| .02 | 5.785 |
| .05 | 5.620 |
| .10 | 5.687 |
| .20 | 5.940 |
| .50 | 6.71 |
| .70 | 7.62 |

**$AlBr_3$ (130)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.0133 | 6.77 |
| .05 | 6.40 |
| .10 | 6.40 |

**$Al_2(SO_4)_3$ (149)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.20 | 3.92 |
| .50 | 4.19 |
| .878E* | 4.56 |

* Ice + $Al_2(SO_4)_3 \cdot 18H_2O$.

**$Al(NO_3)_3$ (125)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.05 | 6.3 |
| .10 | 6.1 |
| .20 | 6.5 |
| .50 | 7.9 |
| .75 | 9.0 |
| 1.00 | 10.6 |

**$AlNH_4(SO_4)_2$ (89)**

E: $\Delta t = 0.20°$, ice + $AlNH_4(SO_4)_2 \cdot 12H_2O$

**$(N_2H_5)_2Al(SO_4)_2 \cdot 12H_2O$ (266)**

Hydrazine aluminium sulfate

**$Al(OH)(C_2H_3O_2)_2$ (243)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.02 | 2.31 |
| .05 | 2.22 |
| .10 | 2.09 |
| .20 | 1.85 |
| .30 | 1.66 |

**$LaCl_3$ (26)**

| | |
|---|---|
| 0.03 | 7.4 |
| .05 | 6.9 |
| .10 | 6.5 |
| .20 | 6.4 |
| .322 | 6.3 |

**$La_2(SO_4)_3$ (108)**

| | |
|---|---|
| 0.001 | 7.14 |
| .002 | 6.36 |
| .004 | 5.55 |
| .007 | 4.87 |
| .01 | 4.41 |

**$La(NO_3)_3$ (93)**

| | |
|---|---|
| 0.001 | 7.00 |
| .002 | 6.314 |
| .005 | 6.483 |
| .01 | 6.233 |
| .02 | 6.007 |
| .05 | 5.743 |
| .10 | 5.607 |
| .18 | 5.042 |

**$CeCl_3$ (40)**

| | |
|---|---|
| 0.0204 | 4.66 |
| .031 | 4.40 |
| .041 | 4.39 |
| .083 | 4.34 |
| .104 | 4.52 |
| .125 | 4.48 |
| .147 | 4.49 |
| .169 | 4.56 |

**$Pr(NO_3)_3$ (122)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.0475 | 5.97 |
| .0950 | 5.71 |
| .190 | 5.53 |
| .380 | 5.74 |

**$NdCl_3$ (26, 169)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.03 | 6.6 |
| .05 | 6.3 |
| .10 | 5.9 |
| .15 | 5.8 |

**$Nd_2(SO_4)_3$ (26)**

| | |
|---|---|
| 0.0067 | 8.5 |
| .01 | 6.4 |
| .02 | 4.6 |
| .05 | 3.8 |
| .08 | 3.6 |

**$BeCl_2$ (76)**

| | |
|---|---|
| 0.025 | 5.55 |
| .05 | 5.28 |
| .10 | 5.15 |
| .15 | 5.22 |
| .25 | 5.44 |

**$BeSO_4$ (58)**

| | |
|---|---|
| 0.03 | 2.50 |
| .05 | 2.33 |
| .10 | 2.21 |
| .20 | 2.12 |
| .30 | 2.06 |

**$Be(NO_3)_2$ (58)**

| | |
|---|---|
| 0.05 | 4.71 |
| .10 | 4.65 |
| .20 | 4.60 |
| .30 | 4.57 |

**$MgCl_2$ (106, 160, 187, 233, 235)**

| | |
|---|---|
| 0.01 | 5.144 |
| .025 | 5.032 |
| .05 | 4.974 |
| .10 | 4.938 |
| .20 | 4.977 |
| .50 | 5.38 |
| 1.0 | 6.35 |
| 2.0 | 8.8 |
| 2.94E* | 11.4 |

* Ice + $MgCl_2 \cdot 12H_2O$.

**$Mg(ClO_3)_2$ (174)**

| | |
|---|---|
| 1.496 | 5.35 |
| 1.871 | 6.41 |

**$MgBr_2$ (125)**

| | |
|---|---|
| 0.05 | 5.34 |
| .10 | 5.11 |
| .20 | 5.19 |
| .40 | 5.54 |
| .70 | 6.14 |
| 1.0 | 6.87 |

**$MgSO_4$ (20, 42, 44, 51, 90, 93, 100, 108, 132, 226, 251)**

| | |
|---|---|
| 0.0005 | 3.5 |
| .001 | 3.38 |
| .002 | 3.24 |
| .0025 | 3.18 |
| .004 | 3.08 |
| .005 | 3.02 |
| .007 | 2.94 |
| .01 | 2.85 |
| .025 | 2.589 |
| .05 | 2.420 |
| .10 | 2.252 |
| .20 | 2.090 |

**$MgSO_4$.—(*Cont'd*)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.25 | 2.036 |
| .40 | 1.99 |
| .70 | 1.98 |
| 1.0 | 2.02 |
| 1.4 | 2.15 |
| 1.636E* | 2.38 |

* Ice + $MgSO_4.12H_2O$.

**$Mg(NO_3)_2$ (77, 233)**

| | |
|---|---|
| 0.08 | 4.73 |
| .10 | 4.74 |
| .20 | 4.78 |
| .30 | 4.85 |
| .50 | 5.08 |
| .70 | 5.35 |
| 1.0 | 5.78 |
| 1.5 | 6.43 |
| 2.0 | 7.0 |
| 3.0 | 7.85 |
| 3.57E* | 8.1 |

* Ice + $Mg(NO_3)_2 \cdot 9H_2O$ (extrap.).

**$(N_2H_5)_2Mg(SO_4)_2 \cdot 4H_2O$ (266)**

Hydrazine magnesium sulfate

**Mg**, Formate; Fumarate; Maleate; Malate (35)

**$MgCu_2(CN)_4$ (85)**

**$MgPt(CN)_4$ (34, 138)**

**$MgB_4O_6$ (228)**

**CaO (92)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.049E* | 3.05 |

* Ice + $CaO.H_2O$?

**$CaCl_2$ (161, 187, 217, 235, 263)**

| | |
|---|---|
| 0.01 | 5.112 |
| .025 | 4.966 |
| .05 | 4.886 |
| .10 | 4.832 |
| .15 | 4.810 |
| .20 | 4.78 |
| .30 | 4.78 |
| .50 | 4.98 |
| 1.0 | 5.85 |
| 2.0 | 7.68 |
| 3.0 | 9.33 |
| 4.325E* | 11.79 |

* Ice + $CaCl_2.6H_2O$.

**$CaBr_2$ (175)**

| | |
|---|---|
| 0.05 | 5.07 |
| .10 | 5.12 |
| .20 | 5.22 |
| .30 | 5.31 |

**$CaI_2$ (175)**

| | |
|---|---|
| 0.03 | 4.95 |
| .05 | 4.91 |
| .10 | 4.88 |
| .20 | 4.93 |

**$CaS_2O_3$ (151)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.5 | 2.14 |
| 0.8 | 2.14 |
| 1.3 | 2.41 |

**$CaS_2O_6$ (110)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.104 | 3.08 |
| .310 | 2.74 |
| .494 | 2.79 |
| .508 | 2.78 |
| .773E* | 2.70 |

* Ice + $CaS_2O_6 \cdot 4H_2O$.

**$Ca(NO_2)_2$ (195)**

| | |
|---|---|
| 1.5 | 2.62 |
| 2.0 | 3.14 |
| 3.0 | 3.83 |
| 4.076E* | 4.3 |

* Ice + $Ca(NO_2)_2 \cdot 4H_2O$.

**$Ca(NO_3)_2$ (15, 125, 188)**

| | |
|---|---|
| 0.05 | 4.7 |
| .10 | 4.58 |
| .20 | 4.50 |
| .40 | 4.47 |
| .70 | 4.51 |
| 1.0 | 4.59 |
| 2.0 | 4.86 |
| 3.0 | 5.18 |
| 4.0 | 5.75 |
| 4.578E* | 6.27 |

* Ice + $Ca(NO_3)_2 \cdot 4H_2O$.

**$Ca(CHO_2)_2$ (35)**

**$Ca(C_2H_3O_2)_2$ (35)**

| | |
|---|---|
| 0.06 | 5.02 |
| .10 | 4.76 |
| .20 | 4.59 |
| .30 | 4.58 |
| .50 | 4.61 |

**Ca**, Salicylate; Lactate (35)

**$Ca(C_6H_5CO_2)_2$ (267)**

E: $\Delta t = 0.37°$

**$CaCu(CN)_3$ (85)**

**$CaCu_3(CN)_5$ (85)**

**$Ca_2Fe(CN)_6$ (188)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.02 | 2.67 |
| .05 | 2.40 |
| .10 | 2.15 |

**$Sr(OH)_2$ (92)**

| | |
|---|---|
| 0.0371E* | 2.7 |

* $Sr(OH)_2 \cdot 8H_2O$.

**$SrCl_2$ (42, 43, 161, 251)**

| | |
|---|---|
| 0.01 | 5.3 |
| .02 | 5.10 |
| .04 | 4.94 |
| .07 | 4.85 |
| .10 | 4.82 |
| .20 | 4.80 |
| .40 | 4.91 |
| .70 | 5.33 |
| 1.00 | 5.83 |
| 2.00 | 7.54 |
| 2.24E* | 8.35 |

* Ice + $SrCl_2.6H_2O$ (extrap.).

$SrBr_2$ (175, 180)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.10 | 5.6 |
| .20 | 5.4 |
| .40 | 5.7 |
| .70 | 6.20 |
| 1.0 | 6.65 |
| 2.0 | 8.35 |
| 2.89E* | 9.69 |

* Ice + $SrBr_2.6H_2O$.

$SrI_2$ (125, 175)

| | |
|---|---|
| 0.03 | 5.4 |
| .07 | 5.23 |
| .10 | 5.2 |
| .20 | 5.3 |
| .40 | 5.8 |
| .70 | 6.58 |
| 1.0 | 7.17 |

$Sr(NO_2)_2$ (195)

| | |
|---|---|
| 0.70 | 1.81 |
| 1.0 | 2.10 |
| 2.0 | 2.43 |
| 2.72E* | 2.50 |

* Ice + $Sr(NO_2)_2.H_2O$.

$Sr(NO_3)_2$ (42, 43, 44, 125, 129, 251)

| | |
|---|---|
| 0.01 | 5.7 |
| .02 | 5.35 |
| .04 | 5.00 |
| .07 | 4.76 |
| .10 | 4.63 |
| .20 | 4.40 |
| .40 | 4.17 |
| .70 | 4.00 |
| 1.0 | 3.90 |
| 1.533E* | 3.78 |

* Ice + $Sr(NO_3)_2.4H_2O$.

$Sr(CHO_2)_2$ (35)

$Sr(C_2H_3O_2)_2$ (35)

| | |
|---|---|
| 0.06 | 5.57 |
| .10 | 5.16 |
| .20 | 4.90 |
| .30 | 4.89 |
| .50 | 4.96 |

$SrCu_2(CN)_4$ (85)

BaO (92)

| | |
|---|---|
| 0.098E* | 5.10 |

* Ice + $Ba(OH)_2.8H_2O$.

$Ba(OH)_2$ (104)

$BaCl_2$ (20, 91, 93, 118, 138, 160, 161, 187, 217, 251)

| | |
|---|---|
| 0.001 | 5.30 |
| .002 | 5.225 |
| .005 | 5.120 |
| .01 | 5.034 |
| .02 | 4.938 |
| .05 | 4.796 |
| .10 | 4.698 |
| .20 | 4.64 |
| .40 | 4.74 |
| .70 | 4.95 |
| 1.00 | 5.20 |
| 1.346E* | 5.57 |

* Ice + $BaCl_2.2H_2O$.

$Ba(ClO_3)_2$ (271)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.5927E* | 4.638 ± 0.007 |

* Ice + $Ba(ClO_3)_2.H_2O$.

$BaBr_2$ (175, 180, 233)

| | |
|---|---|
| 0.08 | 4.86 |
| .10 | 4.85 |
| .20 | 4.85 |
| .30 | 4.90 |
| .50 | 5.06 |
| 1.0 | 5.58 |
| 2.0 | 6.72 |
| 2.936E* | 7.7 |

* Ice + $BaBr_2.2H_2O$.

$Ba(BrO_3)_2$ (271)

| | |
|---|---|
| 0.00714E | 4.76* ± 0.28 |

* Ice + $Ba(BrO_3)_2.H_2O$.

$BaI_2$ (175)

| | |
|---|---|
| 0.03 | 5.12 |
| .05 | 5.07 |
| .10 | 5.00 |
| .15 | 4.99 |
| .20 | 5.02 |

$Ba(IO_3)_2$ (271)

| Conc. %* | $\Delta t$ |
|---|---|
| 0.008E† | 0.046 ± 0.002° |

* Either temperature or concentration must be in error.

† Ice + $Ba(IO_3)_2.H_2O$.

$BaS_2O_6$ (110)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.077 | 3.12 |
| .139 | 2.44 |
| .203 | 2.36 |
| .275E* | 2.33 |

* Ice + $BaS_2O_6.2H_2O$.

$Ba(NO_2)_2$ (195)

| | |
|---|---|
| 0.5 | 3.39 |
| 1.0 | 3.18 |
| 2.0 | 2.90 |
| 2.296E* | 2.83 |

* Ice + $Ba(NO_2)_2.H_2O$.

$Ba(NO_3)_2$ (89, 100, 108, 187, 233); *cf.* (298)

| | |
|---|---|
| 0.001 | 5.39 |
| .002 | 5.29 |
| .004 | 5.18 |
| .007 | 5.08 |
| .01 | 5.01 |
| .02 | 4.87 |
| .04 | 4.68 |
| .07 | 4.45 |
| .10 | 4.25 |
| .20 | 3.79 |
| .214E* | 3.74 |

* Ice + $Ba(NO_3)_2$.

$Ba(CHO_2)_2$ (35)

$Ba(C_2H_3O_2)_2$ (35)

| | |
|---|---|
| 0.03 | 5.19 |
| .05 | 5.06 |
| .10 | 4.82 |
| .20 | 4.81 |

$Ba(C_2H_3O_2)_2$.— (*Continued*)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.30 | 4.79 |
| .50 | 4.87 |

Ba, Propionate; Salicylate (35)

$BaCu(CN)_3$ (85)

$BaCu_2(CN)_4$ (85)

$Ba[NO.(CN)_5.Fe]$ (33)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.025 | 3.56 |
| .04 | 3.18 |
| .07 | 2.92 |
| .10 | 2.82 |
| .20 | 2.73 |

LiOH (212, 226)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.34 | 3.72 |
| .70 | 3.4 |
| 1.0 | 3.3 |
| 2.0 | 3.23 |
| 4.0 | 3.29 |
| 5.28E* | 3.4 |

* Ice + $LiOH.H_2O$.

LiCl (58, 111, 112, 161, 187, 235, 282)

| | |
|---|---|
| 0.005 | 3.612 |
| .006 | 3.609 |
| .01 | 3.598 |
| .02 | 3.582 |
| .05 | 3.553 |
| .10 | 3.52 |
| .20 | 3.50 |
| .30 | 3.51 |
| .50 | 3.58 |
| 1.0 | 3.80 |
| 2.0 | 4.41 |
| 3.0 | 5.04 |
| 4.0 | 5.56 |
| 4.4 | 4.75 |

$LiClO_3$ (144.5)

| | |
|---|---|
| 2 | 4.42 |
| 2.5 | 4.493 |
| 3 | 4.612 |
| 3.5 | 4.80 |
| 4 | 5.30 |
| 4.5 | 5.265 |
| 5 | 5.507 |
| 5.5 | 5.724 |
| 6.0 | 5.94 |
| 6.50E* | 6.16 |

* Ice + $LiClO_3.3H_2O$.

LiBr (23)

| | |
|---|---|
| 0.075 | 3.72 |
| .10 | 3.71 |
| .20 | 3.70 |
| .50 | 3.80 |
| 1.00 | 4.0 |

LiI (23)

| | |
|---|---|
| 0.075 | 3.63 |
| .10 | 3.64 |
| .20 | 3.67 |
| .50 | 3.78 |
| .75 | 4.1 |

$Li_2SO_4$ (58)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.0536 | 4.6 |
| .106 | 4.62 |
| .272 | 4.35 |
| .866 | 4.33 |

$LiNO_2$ (195)

| | |
|---|---|
| 2.0 | 3.66 |
| 4.0 | 3.81 |
| 6.0 | 3.93 |
| 7.864E* | 3.98 |

* Ice + $LiNO_2.H_2O$.

$LiNO_3$ (23, 57)

| | |
|---|---|
| 0.04 | 3.38 |
| .10 | 3.35 |
| .20 | 3.33 |
| .50 | 3.35 |
| 1.00 | 3.48 |

E*: $\Delta t = 17.8°$.

* Ice + $LiNO_3.3H_2O$.

$(N_2H_5)_2Li_2(SO_4)_2$ Hydrazine lithium sulfate (266)

$Li_2SiO_3$ (133)

| | |
|---|---|
| 0.008 | 9.0 |
| .01 | 8.6 |
| .02 | 7.7 |
| .0312 | 7.3 |

$Li_2Si_2O_{11}$ (133)

$LiCu(CN)_3$ (85)

$Li_2O.B_2O_3$ (156)

| | |
|---|---|
| 0.0607E* | 9.88 |

* Ice + $Li_2O.B_2O_3.16H_2O$.

NaOH (119, 140, 161, 212)

| | |
|---|---|
| 0.01 | 3.55 |
| .02 | 3.51 |
| .05 | 3.46 |
| .10 | 3.42 |
| .20 | 3.41 |
| .50 | 3.40 |
| 1.0 | 3.44 |
| 2.0 | 3.58 |
| 4.0 | 4.10 |
| 6.11E* | 4.58 |

* Ice + $NaOH.7H_2O$ (extrap.).

NaF (92, 203)

| | |
|---|---|
| 0.04 | 3.73 |
| .07 | 3.65 |
| .10 | 3.60 |
| .20 | 3.50 |
| .50 | 3.35 |

E*: $\Delta t = 5.6°$

* Ice + NaF.

NaCl (13, 72, 98, 100, 111, 112, 118, 161, 187, 194, 217, 233, 235)

| | |
|---|---|
| 0.001 | 3.66 |
| .002 | 3.655 |
| .004 | 3.642 |

NaCl.—(*Continued*)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.007 | 3.620 |
| .01 | 3.604 |
| .02 | 3.570 |
| .04 | 3.530 |
| .07 | 3.498 |
| .10 | 3.478 |
| .20 | 3.424 |
| .40 | 3.38 |
| .70 | 3.36 |
| 1.0 | 3.37 |
| 2.0 | 3.45 |
| 3.0 | 3.605 |
| 4.0 | 3.785 |
| 5.20E* | 4.061 |

* Ice + $NaCl.2H_2O$.

$NaClO_3$ (72)

| | |
|---|---|
| 0.001 | 3.682 |
| .002 | 3.663 |
| .004 | 3.635 |
| .007 | 3.606 |
| .01 | 3.588 |
| .02 | 3.547 |
| .04 | 3.498 |
| .07 | 3.459 |
| .10 | 3.433 |

NaBr (88, 111, 187, 233)

| | |
|---|---|
| 0.02 | 3.611 |
| .05 | 3.551 |
| .10 | 3.507 |
| .20 | 3.468 |
| .50 | 3.456 |
| 1.0 | 3.51 |
| 2.0 | 3.68 |
| 6.56E* | 4.27 |

* Ice + $NaBr.5H_2O$.

$NaBrO_3$ (72, 112, 187)

| | |
|---|---|
| 0.001 | 3.69 |
| .002 | 3.678 |
| .004 | 3.658 |
| .007 | 3.632 |
| .01 | 3.609 |
| .02 | 3.568 |
| .05 | 3.492 |
| .10 | 3.418 |

NaI (125, 178, 250)

| | |
|---|---|
| 0.08 | 3.74 |
| .10 | 3.68 |
| .20 | 3.52 |
| .40 | 3.48 |
| .70 | 3.55 |
| 1.0 | 3.66 |
| 2.0 | 3.97 |
| *ca.* 4.27E* | 7.4 |

* Ice + $NaI.5H_2O$.

$NaIO_3$ (93, 112, 187)

| | |
|---|---|
| 0.002 | 3.617 |
| .005 | 3.594 |
| .01 | 3.560 |
| .02 | 3.511 |
| .05 | 3.412 |
| .10 | 3.288 |

$Na_2S$ (116)

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.10 | 7.12 |
| .20 | 7.06 |
| .40 | 6.97 |
| .70 | 6.90 |
| 1.0 | 6.87 |
| 1.43 | 6.86 |
| $N_w$ (254) | $\Delta t/N$ |
| 1.039E* | 9.15 |

* Ice + $Na_2S.9H_2O$

The results of (116) and (254) are not in agreement.

Na, Polysulfides (152)

$Na_2SO_3$ (73, 99)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.15 | 4.48 |
| .20 | 4.36 |
| .40 | 4.03 |
| .70 | 3.74 |
| .992E* | 3.54 |

* Ice + $Na_2SO_3.7H_2O$.

$Na_2SO_4$ (6, 98, 160, 187); *cf.* (298)

| | |
|---|---|
| 0.005 | 5.2 |
| .01 | 5.04 |
| .02 | 4.874 |
| .04 | 4.670 |
| .07 | 4.477 |
| .10 | 4.344 |
| .20 | 4.057 |
| .25 | 3.944 |
| .282E* | 3.89 |

* Ice + $Na_2SO_4.10H_2O$.

$Na_2S_2O_3$ (92, 231)

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.2 | 4.24 |
| .4 | 3.94 |
| .54 | 3.70 |
| $N_w$ | $\Delta t/N$ |
| *ca.* 2.71E* | 4.05 |

* Ice + $Na_2S_2O_3.5H_2O$.

$Na_2S_2O_4$ (115, 157)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.04 | 4.8 |
| .07 | 4.7 |
| .10 | 4.6 |
| .20 | 4.47 |
| .40 | 4.29 |
| .70 | 4.2 |
| 1.09E* | 4.2 |

* Ice + $Na_2S_2O_4.2H_2O$.

$Na_2S_2O_5$ (73)

| | |
|---|---|
| 0.08 | 7.26 |
| .10 | 7.05 |
| .20 | 6.60 |
| .40 | 6.24 |
| .70 | 5.96 |
| 1.0 | 5.78 |
| 1.616E* | 5.60 |

* Ice + $Na_2S_2O_5.7H_2O$.

$NaHSO_4$ (60)

| | |
|---|---|
| 0.1004 | 4.05 |

**$Na_2SeO_3$ (47)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.05 | 4.95 |
| .10 | 4.74 |
| .20 | 4.51 |
| .34 | 4.32 |

**$NaHSeO_3$ (47)**

| | |
|---|---|
| 0.07 | 3.62 |
| .10 | 3.59 |
| .20 | 3.49 |
| .50 | 3.30 |

**$NaNO_2$ (195)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 1.6 | 2.76 |
| 2.0 | 2.65 |
| 4.0 | 2.24 |
| 7.0 | 1.85 |
| 9.54E* | 1.62 |

* Ice + $NaNO_2$.

**$NaNO_3$ (160, 187, 233, 235, 242)**

| | |
|---|---|
| 0.01 | 3.55 |
| .02 | 3.53 |
| .04 | 3.484 |
| .07 | 3.438 |
| .10 | 3.406 |
| .20 | 3.327 |
| .40 | 3.22 |
| .70 | 3.11 |
| 1.0 | 3.02 |
| 2.0 | 2.79 |
| 4.0 | 2.53 |
| 7.35E* | 2.375 |

* Ice + $NaNO_3$.

**$NaPO_3$ (114, 269)**

**$Na_3PO_4$ (161)**

| | |
|---|---|
| 0.01 | 7.15 |
| .02 | 6.85 |
| .05 | 6.11 |
| .10 | 5.69 |

**$NaH_2PO_2$ (205)**

**$NaH_2PO_4$ (205)**

**$Na_2HPO_4$ (94, 161)**

| | |
|---|---|
| 0.01 | 4.99 |
| .02 | 4.85 |
| .05 | 4.61 |
| .10 | 4.34 |
| .104E* | 4.53 |

* Ice + $Na_2HPO_4.12H_2O$. $\Delta t/N = 4.32$ would agree with the curve.

**$NaNH_4.HPO_4$ (161)**

| | |
|---|---|
| 0.01 | 4.95 |
| .02 | 4.78 |
| .05 | 4.51 |
| .10 | 4.23 |
| .20 | 3.87 |

**$Na_2CO_3$ (89, 119, 160)**

| | |
|---|---|
| 0.01 | 5.12 |
| .02 | 4.93 |
| .04 | 4.73 |
| .07 | 4.55 |
| .10 | 4.44 |
| .20 | 4.17 |
| .40 | 3.88 |
| .595E* | 3.53 |

* Ice + $Na_2CO_3.10H_2O$.

**$Na_2C_2O_4$ (92)**

E: $\Delta t = 1.7°$

**$Na_6C_{12}O_{12}$ (270)**

Mellitate

**$NaCHO_2$ (259)**

**$NaHCO_3$ (83)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.1 | 3.65 |
| .2 | 3.51 |
| .4 | 3.26 |
| .7 | 3.02 |

**$NaC_2H_3O_2$ (91, 125, 140, 251)**

| | |
|---|---|
| 0.06 | 3.63 |
| .10 | 3.59 |
| .20 | 3.58 |
| .40 | 3.62 |
| .70 | 3.70 |
| 1.0 | 3.78 |
| 2.0 | 4.14 |
| 3.7E* | 4.86 |

* Ice + $NaC_2H_3O_2.?H_2O$.

**$NaC_3H_5O_3$ (259)**

Lactate

**$NaC_4H_7O_2$ (205)**

Butyrate

**$NaC_7H_5O_3$ (259)**

Salicylate

**$NaC_7H_5O_2$ (259)**

Benzoate

**$NaC_{18}H_{33}O_2$ (135)**

Oleate

**$Na_2C_4H_4O_4$ (205)**

Succinate

**$Na_2C_6H_6O_7$ (105)**

Citrate

**$NaC_2H_2ClO_2$ (259)**

Chloroacetate

**$NaC_2HCl_2O_2$ (205, 259)**

Dichloroacetate

**$NaC_2Cl_3O_2$ (259)**

Trichloroacetate

**$C_5H_{11}NaSO_4$ (37)**

**Na**, Cyanoacetates (295)

***d*-$NaNH_4C_4H_4O_6$ (225)**

***dl*-$NaNH_4C_4H_4O_6$ (225)**

**$Na_2Si_5O_{11}$ (133)**

**$Na_2SiO_3$ (161)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.01 | 6.6 |
| .02 | 6.42 |
| .04 | 6.06 |
| .07 | 5.64 |
| .10 | 5.32 |
| .20 | 4.71 |
| .50 | 4.02 |

**$NaHSiO_3$ (133)**

**$Na_2Hg(SO_3)_2$ (14)**

**$NaSO_3.HgOH$ (14)**

**$NaCu(CN)_2$ (85)**

**$NaCu_2(CN)_3$ (85)**

**$Na_2Cu(CN)_3$ (85)**

**$Na_3Cu(CN)_4$ (85)**

**$Na_2[Fe(CN)_5NO]$ (33)**

**$Co(NO_2)_6Na_3$ (97)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.0163 | 6.74 |
| .0312 | 6.89 |

**$Na_2CrO_4$ (125, 293)**

| | |
|---|---|
| 0.1 | 4.49 |
| .2 | 4.23 |
| .4 | 3.97 |
| .7 | 3.80 |
| 1.0 | 3.71 |

E:* $\Delta t = 4.9°$

* Ice + $Na_2CrO_4.10H_2O$.

**$Na_2Cr_2O_7$ (125)**

| | |
|---|---|
| 0.1 | 4.82 |
| .2 | 4.62 |
| .4 | 4.50 |

**$Cr(CNS)_6Na_3$ (41)**

**$NaVO_3$ (63)**

**$NaBO_2$ (172)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.04 | 3.56 |
| .07 | 3.38 |
| .10 | 3.26 |

**$Na_2B_4O_7$ (134)**

| | |
|---|---|
| 0.015 | 10.4 |
| .02 | 10.0 |
| .04 | 8.96 |
| .07 | 8.0 |
| .10 | 7.2 |

**Na**, Salts of the acids of boron (134)

**KOH (100, 119, 140, 161, 187, 190, 212)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.005 | 3.66 |
| .01 | 3.65 |
| .02 | 3.62 |
| .05 | 3.50 |
| .10 | 3.42 |
| .20 | 3.39 |
| .50 | 3.44 |
| 1.0 | 3.60 |
| 2.0 | 3.96 |
| 3.0 | 4.41 |
| 5.0 | 5.77 |
| 7.95 | 8.2 |

**KF (23)**

| | |
|---|---|
| 0.06 | 3.47 |
| .10 | 3.39 |
| .20 | 3.35 |
| .50 | 3.36 |
| 1.00 | 3.39 |

**KCl (4, 13, 20, 72, 101, 108, 111, 112, 117, 160, 161, 187, 217, 233, 235)**

| | |
|---|---|
| 0.001 | 3.66 |
| .002 | 3.658 |

KCl.—(*Continued*)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.005 | 3.648 |
| .01 | 3.610 |
| .02 | 3.566 |
| .05 | 3.503 |
| .10 | 3.451 |
| .20 | 3.394 |
| .50 | 3.314 |
| 1.0 | 3.250 |
| 1.5 | 3.223 |
| 2.0 | 3.220 |
| 3.0 | 3.231 |
| 3.30E* | 3.24 |

* Ice + KCl.

**$KClO_3$ (87, 112, 187)**

| | |
|---|---|
| 0.01 | 3.556 |
| .02 | 3.513 |
| .05 | 3.435 |
| .10 | 3.334 |

E: $\Delta t = 0.5°$

**KBr (111, 187, 217, 233, 235)**

| | |
|---|---|
| 0.025 | 3.550 |
| .05 | 3.500 |
| .10 | 3.452 |
| .20 | 3.400 |
| .30 | 3.368 |
| .50 | 3.330 |
| 1.0 | 3.290 |
| 2.0 | 3.275 |
| 3.0 | 3.279 |
| 3.836E* | 3.285 |

* Ice + KBr.

**$KBrO_3$ (112, 187)**

| | |
|---|---|
| 0.01 | 3.573 |
| .02 | 3.524 |
| .05 | 3.445 |
| .10 | 3.348 |

**KI (19, 23, 150, 233)**

| | |
|---|---|
| 0.08 | 3.58 |
| .10 | 3.54 |
| .20 | 3.44 |
| .50 | 3.38 |
| 1.0 | 3.37 |
| 2.0 | 3.40 |
| 3.0 | 3.45 |
| 5.0 | 3.50 |
| 6.58E* | 3.50 |

* Ice + KI.

**$KIO_3$ (93, 112, 187)**

| | |
|---|---|
| 0.002 | 3.61 |
| .005 | 3.595 |
| .01 | 3.558 |
| .02 | 3.505 |
| .05 | 3.402 |
| .10 | 3.273 |

**$KIO_4$ (47)**

**$K_4I_2O_9.9H_2O$ (47)**

**$K_3IO_5.4H_2O$ (47)**

**$K_2SO_3$ (73)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.30 | 4.49 |
| .50 | 4.29 |
| .70 | 4.21 |
| 1.0 | 4.19 |

$K_2SO_3$.—(*Cont'd*)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 2.0 | 4.53 |
| 3.0 | 5.13 |
| 5.0 | 6.13 |
| 6.577E* | 6.92 |

* Ice + $K_2SO_3$.

**$K_2SO_4$ (6, 30, 93, 108, 118, 145, 160, 187, 194, 217, 233)**

| | |
|---|---|
| 0.001 | 5.280 |
| .0025 | 5.258 |
| .005 | 5.150 |
| .01 | 5.010 |
| .025 | 4.772 |
| .05 | 4.559 |
| .10 | 4.319 |
| .20 | 4.044 |
| .30 | 3.882 |
| .402E* | 3.79 |

* Ice + $K_2SO_4$.

**$K_2S_2O_5$ (73)**

| | |
|---|---|
| 0.16 | 6.25 |
| .20 | 6.13 |
| .50 | 5.64 |
| 1.0 | 5.20 |
| 1.07E* | 5.14 |

* Ice + $K_2S_2O_5.\frac{3}{2}H_2O$.

**$K_2S_2O_6$ (47)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.06 | 4.5 |
| .10 | 4.1 |
| .12 | 4.0 |

**$K_2S_2O_8$ (182, 221)**

**$KNO_2$ (195)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 2.0 | 1.98 |
| 4.0 | 1.93 |
| 7.0 | 1.82 |
| 10.0 | 1.68 |
| 15.0 | 1.45 |
| 20.0 | 1.26 |
| 29.92E* | 1.056 |

* Ice + $KNO_2$.

**$KNO_3$ (4, 87, 155, 187, 233, 242)**

| | |
|---|---|
| 0.002 | 3.655 |
| .005 | 3.638 |
| .01 | 3.590 |
| .02 | 3.537 |
| .05 | 3.431 |
| .10 | 3.314 |
| .20 | 3.154 |
| .30 | 3.048 |
| .50 | 2.882 |
| 1.0 | 2.56 |
| 1.247E* | 2.41 |

* Ice + $KNO_3$ (rhombic).

**$KPO_3$ (269)**

**$K_4P_2O_6$ (47)**

**$K_4P_2O_7$ (47)**

**$KH_2PO_4$ (161)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.02 | 3.59 |
| .05 | 3.47 |
| .10 | 3.34 |
| .20 | 3.19 |

**$K_6H_6P_2O_6$ (47)**

Various salts

**$K_2CO_3$ (42, 44, 119, 160, 177)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.01 | 5.20 |
| .02 | 5.00 |
| .05 | 4.74 |
| .10 | 4.56 |
| .20 | 4.42 |
| .50 | 4.39 |
| 1.0 | 4.51 |
| 2.0 | 5.01 |
| 3.0 | 5.87 |
| 4.0 | 6.95 |
| 4.74E* | 7.7 |

* Ice + $K_2CO_3.xH_2O$.

**$K_2C_2O_4$ (140)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.1 | 4.46 |
| .25 | 4.26 |
| .5 | 4.18 |
| $N_w$ (92) | $\Delta t/N$ |
| 1.62E | 3.9 |

**$KHCO_3$ (73)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.25 | 3.21 |
| .50 | 3.09 |
| 1.0 | 2.91 |
| 2.0 | 2.68 |

**$KHC_2O_4$ (61)**

| | |
|---|---|
| 0.025 | 3.63 |
| .05 | 3.49 |
| .10 | 3.34 |
| .15 | 3.24 |

**$KC_2H_3O_2$ (91)**

| | |
|---|---|
| 0.50 | 3.78 |
| 1.0 | 3.92 |
| 2.0 | 4.22 |
| 3.0 | 4.55 |
| 4.37 | 5.15 |

**$K_2C_4H_4O_6$ (131)**

0.05–0.9 | 3.8 ± 0.1

**$C_5H_{11}KSO_4$ (37)**

**KCN (23, 158)**

| | |
|---|---|
| 0.03 | 3.55 |
| .05 | 3.49 |
| .10 | 3.41 |
| .20 | 3.34 |
| .50 | 3.27 |
| 1.0 | 3.25 |
| 2.0 | 3.27 |
| 5.0 | 3.44 |
| 7.0 | 3.51 |

E: $\Delta t = 29.61°$

**KCNO (158)**

| | |
|---|---|
| 1.2 | 3.44 |
| 2.0 | 3.65 |
| 3.0 | 3.91 |
| 4.0 | 4.45 |

E: $\Delta t = 18.14°$

**KCNS (23)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.06 | 3.49 |
| .10 | 3.44 |
| .20 | 3.37 |
| .50 | 3.25 |
| .85 | 3.16 |

(251)

| | |
|---|---|
| 1.029 | 3.16 |
| 2.058 | 3.16 |
| 3.086 | 3.17 |

(276)

| | |
|---|---|
| 10.4E* | 3.0 |

* Ice + KCNS.

**$KAsOC_4H_4O_6$ (131)**

**$KSbOC_4H_4O_6$ (16, 131)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.03– | 2.1 ± |
| 0.125 | 0.2 |

**$K_2SiO_3$ (133)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.015 | 7.07 |
| .02 | 7.02 |
| .05 | 6.55 |
| .10 | 5.87 |
| .125 | 5.68 |

**$KHSiO_3$ (133)**

**$K_2Hg(SO_3)_2$ (14)**

**$K_2Hg(CN)_4$ (122)**

**$KCu(CN)_2$ (85)**

**$KCu_2(CN)_3$ (85)**

**$K_3Cu(CN)_4$ (85)**

**$K_6Cu_2(CN)_8$ (272)**

**$KAg(CN)_2$ (155)**

**$K_2PtCl_4$ (204)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.03 | 5.12 |
| .06 | 4.62 |
| .08 | 4.51 |
| .20 | 4.47 |

**$KMnO_4$ (20, 187, 278)**

| | |
|---|---|
| 0.005 | 3.600 |
| .006 | 3.590 |
| .01 | 3.570 |
| .02 | 3.554 |
| .19E* | 3.05 |

* Ice + $KMnO_4$.

**$K_2[Fe(CN)_5NO]$ (33)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.04 | 5.15 |
| .07 | 4.83 |
| .10 | 4.64 |
| .20 | 4.36 |

**$K_3Fe(CN)_6$ (20, 92, 138, 187)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.0005 | 7.3 |
| .001 | 7.10 |
| .002 | 6.87 |
| .005 | 6.53 |
| .01 | 6.26 |
| .02 | 5.98 |
| .05 | 5.60 |
| .10 | 5.30 |

**$K_3Fe(CN)_6$.— (*Continued*)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.20 | 5.00 |
| .50 | 4.55 |

E:* $\Delta t = 3.9°$

* Ice + $K_3Fe(CN)_6$.

**$K_4Fe(CN)_6$ (92, 187, 188, 294)**

| | |
|---|---|
| 0.0075 | 6.9 |
| .0125 | 6.57 |
| .025 | 6.17 |
| .05 | 5.72 |
| .075 | 5.41 |
| .10 | 5.18 |
| .125 | 5.00 |
| .191 | 4.80 |
| .363E* | 4.52 |

* Ice + $K_4Fe(CN)_6 \cdot 3H_2O$.

**$Co(NH_3)_2(NO_2)_4K$ (97)**

| | |
|---|---|
| 0.002 | 3.68 |
| .005 | 3.652 |
| .01 | 3.620 |
| .02 | 3.573 |

**$K_3(COS)_6Co$ (234)**

**$K_3Co(CN)_6$ (138)**

| | |
|---|---|
| 0.01 | 5.7 |
| .02 | 5.2 |
| .05 | 4.7 |

**$K_2Ni(CN)_4$ (138)**

| | |
|---|---|
| 0.06 | 5.1 |
| .10 | 5.0 |
| .20 | 4.8 |
| .50 | 4.4 |

**$K_2CrO_4$ (42, 43, 89, 143, 251)**

| | |
|---|---|
| 0.5 | 3.0 |
| 1.0 | 3.3 |
| 1.5 | 3.47 |
| 2.0 | 3.6 |
| 2.5 | 3.74 |
| 2.81– | 3.81– |
| 2.97E* | 3.84 |

* Ice + $K_2CrO_4$.

**$K_2Cr_2O_7$ (20)**

| | |
|---|---|
| 0.0005 | 7.25 |
| .001 | 7.06 |
| .002 | 6.73 |
| .004 | 6.38 |

(2)

| | |
|---|---|
| .0502 | 5.38 |
| .1009 | 4.85 |

(143)

| | |
|---|---|
| .153E* | 4.12 |

* Ice + $K_2Cr_2O_7$.

**$CrK(SO_4)_2$ (127)**

**$K_3Cr(C_2O_4)_3$ (138)**

**$K_2Mo_2O_8$ (182)**

**$KVO_3$ (63)**

**3KCNS.V(CNS)$_3$ (41)**

**$KBO_2$ (172)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.015 | 3.8 |
| .030 | 3.63 |
| .05 | 3.51 |

**$KBO_2$.—(*Cont'd*)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.10 | 3.36 |
| .20 | 3.26 |

**$K_2B_4O_6$ (228)**

**$K_2B_4O_7$ (172)**

| | |
|---|---|
| 0.01 | 11.0 |
| .02 | 9.8 |
| .05 | 8.14 |
| .10 | 6.83 |
| .125 | 6.38 |

**$KBOC_4H_4O_6$ (131)**

**$AlK(SO_4)_2$ (243)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.0206 | 4.61 |
| .0458 | 4.08 |
| .1147 | 3.66 |

**$KNaSO_3$ (14)**

**$KNaC_4H_4O_6$ (105)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.02–0.07 | 4.7–4.0 |

**RbF (65)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.12– | 3.45 ± |
| 0.27 | 0.05 |

**$RbHF_2$ (65)**

| | |
|---|---|
| 0.13– | 3.7 ± |
| 0.27 | 0.2 |

**RbCl (23)**

| | |
|---|---|
| 0.1 | 3.47 |
| .2 | 3.40 |
| .5 | 3.30 |
| .8 | 3.26 |

**$Rb_2SO_4$ (58)**

| | |
|---|---|
| 0.02 | 5.55 |
| .05 | 5.15 |
| .10 | 4.62 |
| .16 | 4.26 |

**$RbNO_3$ (23)**

| | |
|---|---|
| 0.05 | 3.45 |
| .10 | 3.34 |
| .20 | 3.19 |
| .50 | 2.88 |
| .83 | 2.64 |

**$Rb_2SiO_3$ (133)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.01– | 9.4–8.9 |
| .015 | |

**$RbCu(CN)_2$ (85)**

**$Rb_2Cu_3(CN)_5$ (85)**

**CsCl (23, 111, 187)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.02 | 3.586 |
| .05 | 3.515 |
| .10 | 3.454 |
| .20 | 3.385 |
| .30 | 3.339 |
| .40 | 3.304 |
| .50 | 3.275 |

**CsI (74)**

| | |
|---|---|
| 1.475E* | 2.71 |

* Ice + CsI.

**$Cs_2SO_4$ (58)**

| | |
|---|---|
| 0.0120 | 5.40 |
| .0232 | 4.96 |
| .0480 | 4.77 |
| 1592 | 4.20 |

**$CsNO_3$ (108, 242, 281, 282)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.001 | 3.66 |
| .005 | 3.63 |
| .01 | 3.585 |
| .025 | 3.476 |
| .05 | 3.387 |

**$CsNO_3$.—(*Cont'd*)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.10 | 3.276 |
| .20 | 3.108 |
| .30 | 2.992 |
| .437E* | 2.870 |

* Ice + $CsNO_3$.

**$Cs_2SiO_3$ (133)**

| $N_v$ | $\Delta t/N$ |
|---|---|
| 0.0104 | 6.5 |
| .0156 | 6.5 |

## Solutions of More Than One Solute Where at Least One of the Solutes is a Strong Electrolyte

ℬ-Table

Standard arrangement (*v.* Vol. III, p. viii)

$H_2O_2$-$H_2SO_4$ (221)
$H_2O_2$-$(NH_4)_2SO_4$ (123, 128)
$H_2O_2$-$H_3BO_3$ (172)
$H_2O_2$-NaOH (36)
$H_2O_2$-$NaBO_2$ (172)
$H_2O_2$-$KNO_3$ (123, 128)
$H_2O_2$-$K_2SO_4$ (136)
$H_2O_2$-$K_2B_4O_7$ (172)
HF-$H_3BO_3$ (3)
HCl-$NH_4OH$ (46)
HCl-$CdCl_2$ (49)
HCl-$HgCl_2$ (155)
HCl-NaOH (46)
$HClO_3$-KOH (46)
$HClO_4$-NaOH (46)
HBr-$CdBr_2$ (49)
$I_2$-HI (193)
$I_2$-$CdI_2$ (275)
$I_2$-KI (155, 193)
HI-$I_2$ (193)
HI-$CdI_2$ (48)
$HIO_3$-KOH (47)
$HIO_4$-NaOH (47)
$HIO_4$-KOH (47)
$SO_2$-KI (279)
$H_2SO_4$-$H_2O_2$ (221)
$H_2SO_4$-$NH_4OH$ (46)
$H_2SO_4$-KOH (46)
$H_2S_2O_6$-NaOH (47)
$H_2SeO_3$-KOH (47)
$NH_4OH$-HCl (46)
$NH_4OH$-$H_2SO_4$ (46)
$NH_4OH$-$H_3PO_2$ (46)
$NH_4OH$-$H_3PO_3$ (46)
$NH_4OH$-$H_3PO_4$ (46)
$NH_4OH$-$H_4P_2O_7$ (47)
$NH_4OH$-$H_3AsO_3$ (46)
$NH_4OH$-$H_3AsO_4$ (46)
$NH_4OH$-AgCl (25)
$NH_4OH$-$H_3BO_3$ (47)
$NH_4NO_2$-$Cd(NO_2)_2$ (52)
$NH_4NO_2$-$Ni(NO_2)_2$ (52)
$NH_4NO_3$-$Pr(NO_3)_3$ (122)
$NH_4Cl$-$CdCl_2$ (49)
$NH_4Cl$-$HgCl_2$ (126)
$NH_4Br$-$CdBr_2$ (49)
$NH_4I$-$CdI_2$ (48)
$(NH_4)_2SO_4$-$H_2O_2$ (123, 128)
$(NH_4)_2SO_4$-$CuSO_4$ (122)
$(NH_4)_2SO_4$-$CdSO_4$ (122)
$H_3PO_2$-$NH_4OH$ (46)
$H_3PO_2$-NaOH (46)
$H_3PO_3$-$NH_4OH$ (46)
$H_3PO_3$-NaOH (46)
$H_3PO_4$-$NH_4OH$ (46)
$H_3PO_4$-NaOH (46)
$H_4P_2O_6$-KOH (47)
$H_4P_2O_7$-$NH_4OH$ (47)
$H_4P_2O_7$-KOH (47)
$H_3AsO_3$-$NH_4OH$ (46)
$H_3AsO_3$-KOH (46)
$H_3AsO_4$-$NH_4OH$ (46)
$H_3AsO_4$-NaOH (46)
$C_2H_6O$-HCl (292)
Methyl ether
$C_6H_5NH_2$-$C_6H_5NH_2$.HCl (296)
$C_9H_8N_2$-HCl (181)
3-Aminoquinoline
$N(CH_3)_4NO_2$-$Hg(NO_2)_2$ (229)
$PbC_4H_4O_6$-KOH (131)
$TlNO_2$-$Cd(NO_2)_2$ (52)
$TlNO_2$-$Ni(NO_2)_2$ (52)
$ZnCl_2$-NaCl (126)
$ZnCl_2$-KCl (126)
$ZnSO_4$-$(NH_4)_2SO_4$ (138)
$CdCl_2$-HCl (49)
$CdCl_2$-$NH_4Cl$ (49)
$CdCl_2$-$SrCl_2$ (126)
$CdCl_2$-NaCl (49)
$CdCl_2$-KCl (49, 126, 138)
$CdBr_2$-HBr (49)
$CdBr_2$-$NH_4Br$ (49)
$CdBr_2$-NaBr (49)
$CdBr_2$-KBr (49)
$CdI_2$-$I_2$ (275)
$CdI_2$-HI (48)
$CdI_2$-$NH_4I$ (48)
$CdI_2$-NaI (48)
$CdI_2$-KI (48)
$CdSO_4$-$(NH_4)_2SO_4$ (122)
$Cd(NO_2)_2$-$NH_4NO_2$ (52)
$Cd(NO_2)_2$-$TlNO_2$ (52)
$Cd(NO_2)_2$-$Ni(NO_2)_2$ (52)
$Cd(NO_2)_2$-$KNO_2$ (52)
$HgCl_2$-HCl (155)
$HgCl_2$-$NH_4Cl$ (126)
$Hg(NO_2)_2$-$N(CH_3)_4NO_2$ (229)
$Hg(NO_2)_2$-$Ni(NO_2)_2$ (53)
$Hg(NO_2)_2$-$Ca(NO_2)_2$ (229)
$Hg(NO_2)_2$-$Ba(NO_2)_2$ (229)
$Hg(NO_2)_2$-$NaNO_2$ (229)
$Hg(NO_2)_2$-$KNO_2$ (53, 229)
$Hg(CN)_2$-KCN (262)
$CuCl_2$-$NH_4Cl$ (125)
$CuCl_2$-$CdCl_2$ (22)
$CuSO_4$-$(NH_4)_2SO_4$ (122)
$CuSO_4$-$C_4H_8O_2$ Ethyl acetate (233)
$CuSO_4$-$C_{12}H_{22}O_{11}$ Sucrose (233)
$CuSO_4$-$Na_2S_2O_3$ (64)
$CuC_4H_4O_6$-KOH (131)
AgCl-$NH_3$ (25)
AgBr-$Na_2S_2O_3$ (231)
$FeF_3$-NaF (203)
$FeSO_4$-$(NH_4)_2SO_4$ (138)
$Ni(NO_2)_2$-$NH_4NO_2$ (52)
$Ni(NO_2)_2$-$TlNO_2$ (52)
$Ni(NO_2)_2$-$Cd(NO_3)_2$ (52)
$Ni(NO_2)_2$-$Hg(NO_2)_2$ (53)
$UO_2(NO_3)_2$-NaCl (56)
$UO_2(NO_3)_2$-$NaC_2H_3O_2$ (56)
$UO_2(NO_3)_2$-$NaC_2H_2ClO_2$ (56) Monochloroacetate
$UO_2(NO_3)_2$-$Na_2C_2O_4$ (56)

$UO_2(C_2H_3O_2)_2$-$NaC_2H_3O_2$ (56)
$UO_2(NO_3)_2$-$Na_3C_6H_5O_7$ (56) Citrate
$H_3BO_3$-$H_2O_2$ (172)
$H_3BO_3$-HF (3)
$H_3BO_3$-$NH_4OH$ (47)
$H_3BO_3$-$C_6H_{14}O_6$ Mannitol (166)
$H_3BO_3$-NaOH (47)
$H_3BO_3$-KOH (47)
$H_3BO_3$-KF (3)
$AlCl_3$-NaCl (126)
$Pr(NO_3)_3$-$NH_4NO_3$ (122)
$MgCl_2$-HCl (55)
$MgCl_2$-$NH_4Cl$ (126)
$MgCl_2$-$C_4H_8O_2$ (233) Ethyl acetate
$MgCl_2$-$C_{12}H_{22}O_{11}$ Sucrose (233)
$MgSO_4$-$(NH_4)_2SO_4$ (138)
$MgSO_4$-$C_2H_5NO_2$ Glycocoll (290)
$Mg(NO_3)_2$-$HNO_3$ (55)
$Mg(NO_3)_2$-$C_4H_8O_2$ Ethyl acetate (233)
$Mg(NO_3)_2$-$C_{12}H_{22}O_{11}$ Sucrose (233)
$CaBr_2$-$Br_2$ (175)
$CaI_2$-$I_2$ (175)
$Ca(NO_2)_2$-$Hg(NO_2)_2$ (229)
$Sr(OH)_2$-Al (104)
$SrCl_2$-$C_2H_5NO_2$ Glycocoll (208, 290)
$SrCl_2$-$CdCl_2$ (126)
$SrBr_2$-$Br_2$ (175)
$SrBr_2$-$I_2$ (175)
$SrBr_2$-$C_2H_5NO_2$ Glycocoll (208, 290)
$SrI_2$-$I_2$ (175)
$Sr(NO_3)_2$-$C_2H_5NO_2$ Glycocoll (208, 290)
$Ba(OH)_2$-Al (104)
$BaCl_2$-$C_2H_5NO_2$ Glycocoll (290)
$BaBr_2$-$Br_2$ (175)
$BaBr_2$-$C_4H_8O_2$ (233) Ethyl acetate
$BaBr_2$-$C_{12}H_{22}O_{11}$ Sucrose (233)
$BaBr_2$-$C_2H_5NO_2$ Glycocoll (290)
$BaI_2$-$I_2$ (124)
$Ba(NO_2)_2$-$Hg(NO_2)_2$ (229)
$Ba(NO_3)_2$-$C_4H_8O_2$ Ethyl acetate (233)
$Ba(NO_3)_2$-$C_{12}H_{22}O_{11}$ Sucrose (233)
$Ba(NO_3)_2$-$C_2H_5NO_2$ Glycocoll (290)
LiCl-$C_4H_8O_2$ (233) Ethyl acetate
LiCl-$C_{12}H_{22}O_{11}$ (233) Sucrose
LiCl-$C_2H_5NO_2$ Glycocoll (208, 290)
LiBr-$C_2H_5NO_2$ (290)
NaOH-$H_2O_2$ (36)
NaOH-HCl (46)
NaOH-$HClO_4$ (46)
NaOH-$HIO_4$ (47)
NaOH-$H_2S_2O_6$ (47)
NaOH-$H_3PO_2$ (46)
NaOH-$H_3PO_3$ (46)
NaOH-$H_3PO_4$ (46)
NaOH-$H_3AsO_4$ (46)
NaOH-$CrO_3$ (47)
NaOH-$H_3BO_3$ (47, 103)
NaOH-$Al(OH)_3$ (103, 189)
NaF-$FeF_3$ (203)
NaF-$FeCl_2$ (203)
NaF-$FeCl_3$ (203, 239)
NaCl-HCl (13, 55)
NaCl-$C_4H_8O_2$ (233) Ethyl acetate
NaCl-$C_{12}H_{22}O_{11}$ Sucrose (233)
NaCl-$C_2H_5NO_2$ Glycocoll (290)
NaCl-$ZnCl_2$ (126)
NaCl-$CdCl_2$ (49)
NaCl-$HgCl_2$ (155)
NaCl-$UO_2(NO_3)_2$ (56)
NaCl-$AlCl_3$ (126)
NaCl-KCl (13, 49)
NaBr-$C_4H_8O_2$ (233) Ethyl acetate
NaBr-$C_{12}H_{22}O_{11}$ Sucrose (233)
NaBr-$C_2H_5NO_2$ Glycocoll (290)
NaBr-$CdBr_2$ (49)
NaI-$C_2H_5NO_2$ (290) Glycocoll
NaI-$CdI_2$ (48)
NaI-KI (48)
$NaIO_3$-$KIO_3$ (93)
$Na_2SO_4$-$K_2SO_4$ (6, 98)
$Na_2S_2O_3$-AgBr (231)
$Na_2S_2O_3$-$CuSO_4$ (64)
$Na_2S_2O_3$-$AgNaS_2O_3$ (14)
NaHS-NaOH (46)
$NaNO_3$-$H_2O_2$ (120)
$NaNO_3$-$C_4H_8O_2$ Ethyl acetate (233)
$NaNO_3$-$C_{12}H_{22}O_{11}$ Sucrose (233)
$NaNO_3$-$C_2H_5NO_2$ Glycocoll (290)
$NaNO_3$-$Pb(NO_3)_2$ (155)
$Na_2C_2O_4$-$UO_2(NO_3)_2$ (56)
$NaC_2H_3O_2$-$UO_2(C_2H_3O_2)_2$ (56)
$NaC_2H_3O_2$-$UO_2(NO_3)_2$ (56)
$Na_3C_6H_5O_7$-$UO_2(NO_3)_2$ (56) Citrate
$NaC_2H_2ClO_2$-$UO_2(NO_3)_2$ (56) Monochloroacetate
$NaBO_2$-$H_2O_2$ (172)
KOH-$HClO_3$ (46)
KOH-$HIO_3$ (47)
KOH-$HIO_4$ (47)
KOH-$H_2SO_4$ (46)
KOH-$H_2SeO_3$ (47)
KOH-$H_4P_2O_6$ (47)
KOH-$H_4P_2O_7$ (47)
KOH-$H_3AsO_3$ (46)
KOH-$PbC_4H_4O_6$ (131)
KOH-$CuC_4H_4O_6$ (131)
KOH-$H_3BO_3$ (3)
KCl-$H_2O_2$ (123, 128)
KCl-HCl (55)
KCl-$C_4H_8O_2$ (233) Ethyl acetate
KCl-$C_6H_{14}O_6$ (98) Mannitol
KCl-$C_{12}H_{22}O_{11}$ (233) Sucrose
KCl-$C_2H_5NO_2$ (290) Glycocoll
KCl-$ZnCl_2$ (126)
KCl-$CdCl_2$ (49, 126, 138)
KCl-$HgCl_2$ (155)
KCl-$CuCl_2$ (121, 125)
KCl-$MgCl_2$ (55, 138)
KCl-$BaCl_2$ (138)
KCl-NaCl (13, 49)
KCl-dextrin, gum arabic, tannic acid, glycerol and albumen (297)
KBr-$C_4H_8O_2$ (233) Ethyl acetate
KBr-$C_{12}H_{22}O_{11}$ (233) Sucrose
KBr-$C_2H_5NO_2$ Glycocoll (290)
KBr-$CdBr_2$ (49)
KBr-$HgBr_2$ (262)
KI-$I_2$ (155, 193, 201)
KI-$SO_2$ (279)
KI-$C_4H_8O_2$ (233) Ethyl acetate
KI-$C_{12}H_{22}O_{11}$ (233) Sucrose
KI-$C_2H_5NO_2$ Glycocoll (208, 290)
KI-$CdI_2$ (48, 122)
KI-$HgI_2$ (262)
KI-NaI (48)
$KIO_3$-$NaIO_3$ (93)

Equimolal mixture

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.01 | 3.565 |
| .02 | 3.515 |
| .05 | 3.408 |
| .10 | 3.277 |

$K_2SO_4$-$H_2O_2$ (136)
$K_2SO_4$-$(NH_4)_2SO)_4$ (138)
$K_2SO_4$-$C_4H_8O_2$ Ethyl acetate (233)
$K_2SO_4$-$C_6H_6O$ (194) Phenol
$K_2SO_4$-$C_6H_{14}O_6$ Mannitol (194)
$K_2SO_4$-$C_{12}H_{22}O_{11}$ Sucrose (233)
$K_2SO_4$-$Na_2SO_4$ (6, 98)
$K_2SO_4$-dextrin, gum arabic and tannic acid (297)
KHS-NaOH (47)
$KNO_2$-$Cd(NO_2)_2$ (52)
$KNO_2$-$Hg(NO_2)_2$ (53, 229)
$KNO_2$-$Ni(NO_2)_2$ (52, 53)
$KNO_3$-$H_2O_2$ (120, 123)
$KNO_3$-$HNO_3$ (55)
$KNO_3$-$C_4H_8O_2$ (233) Ethyl acetate
$KNO_3$-$C_{12}H_{22}O_{11}$ Sucrose (233)
$KNO_3$-$C_2H_5NO_2$ Glycocoll (290)
$KNO_3$-$Pb(NO_3)_2$ (155)
$KNO_3$-KCl (93)

Equimolal mixture

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.01 | 3.60 |
| .02 | 3.555 |
| .05 | 3.468 |
| .10 | 3.390 |
| .20 | 3.283 |

$KNO_3$-dextrin and gum arabic (297)
$K_2HPO_4$-dextrin, gum arabic and tannic acid (297)
KCN-$Hg(CN)_2$ (262)
KCN-AgCN (155)
$K_2B_4O_7$-$H_2O_2$ (172)

## NON-ELECTROLYTES, WEAK ELECTROLYTES AND ALL ORGANIC COMPOUNDS

For abbreviations, *v.* p. 254

Miles S. Sherrill Assisted by Louis Harris

### Solutions Containing One Solute

**𝔅-Table**

Standard arrangement (*v.* Vol. III, p. viii)

**$H_2O_2$ (164, 172)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.4 | 1.86 |
| 5.0 | 1.92 |
| 10.0 | 2.02 |
| 15.0 | 2.10 |
| 20.0 | 2.15 |
| *ca.*24.0E | 2.17 |

**HF (137)**

| | |
|---|---|
| 0.3 | 2.0 |
| 1.0 | 1.9 |
| 3.0 | 2.0 |

**$Cl_2$ (246)**

| | |
|---|---|
| 0.005 | 4.4 |
| .01 | 4.18 |
| .03 | 3.54 |
| .05 | 3.15 |
| .07 | 2.92 |

**HClO (113)**

| | |
|---|---|
| 0.25 | 1.87 |
| .50 | 1.86 |

**$Br_2$ (246)**

| | |
|---|---|
| 0.006 | 2.02 |
| .01 | 1.97 |
| .02 | 1.90 |
| .04 | 1.88 |
| .10 | 1.87 |
| .15 | 1.865 |

**$I_2$ (247)**

| | |
|---|---|
| 0.00074 | 2.0 |

**$H_2S$ (78)**

| | |
|---|---|
| 0.08 | 2.5 |
| .2 | 2.0 |

**$H_2SO_3$ (7, 279)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.1 | 2.5 |
| 0.5 | 2.3 |
| 1.0 | 2.3 |

**$SeO_2$ (167)**

| | |
|---|---|
| 0.1 | 2.22 |
| 1.0 | 1.93 |
| 3.0 | 1.83 |
| 5.0 | 1.81 |
| 7.0 | 1.83 |
| 9.0 | 1.88 |
| 10.0 | 1.91 |
| 12 | 1.95 |

**$H_6TeO_6$ (86)**

| | |
|---|---|
| 0.1 | 2.0 |
| .2 | 2.0 |

**$NH_3$ (252, 264, 265)**

| | |
|---|---|
| 0.5 | 1.86 |
| 2.0 | 1.9 |
| 5.0 | 2.0 |
| 10.0 | 2.2 |
| 15.0 | 2.5 |
| 20.0 | 2.9 |
| 25.0 | 3.3 |
| 30E* | 3.7 |

* Ice + $NH_3.H_2O$.

**$H_3PO_2$ (205)**

| | |
|---|---|
| 0.2 | 2.80 |
| 0.5 | 2.59 |
| 1.0 | 2.45 |

**$H_3PO_3$ (7, 226)**

| | |
|---|---|
| 0.1 | 2.9 |
| 0.5 | 2.5 |
| 1.0 | 2.4 |

**$H_3PO_4$ (38, 137 160)**

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.05 | 2.55 |
| .10 | 2.36 |
| .20 | 2.26 |
| .50 | 2.2 |
| 1.0 | 2.3 |
| 1.5 | 2.5 |
| 2.0 | 2.7 |

**$H_4P_2O_6$ (45)**

| | |
|---|---|
| 0.2 | 3.4 |
| .4 | 3.2 |
| .6 | 3.2 |

**$CO_2$ (78)**

| | |
|---|---|
| 0.05 | 2.1 |
| .08 | 2.1 |

**$H_3BO_3$ (7, 134, 185)**

| | |
|---|---|
| 0.05 | 2.0 |
| .40 | 2.0 |

**$(C_2H_5)_4Fe(CN)_6$ (31)**

| | |
|---|---|
| 0.03 | 1.95 |
| .10 | 1.90 |

**ℭ-Table**

The ℭ-Arrangement (*v.* Vol. III, p. viii)

**$CH_2N_2$ (220) Cyanamide**

| | |
|---|---|
| 0.5 | 1.80 |
| 1.0 | 1.73 |
| 2.0 | 1.61 |
| 5.0 | 1.41 |
| 10.0 | 1.22 |

**$CH_2O_2$ (1, 69) Formic acid**

| | |
|---|---|
| 1.0 | 1.83 |

$CH_2O_2$.—(*Cont'd*)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 2.0 | 1.78 |
| 3.0 | 1.75 |
| 4.0 | 1.71 |
| 5.0 | 1.69 |
| 10 | 1.5 |
| 20 | 1.3 |
| 30 | 1.2 |
| 40 | 1.1 |

$CH_3NO$ (66, 280)
Formamide

| | |
|---|---|
| 0.5 | 1.86 |
| 5.0 | 1.7 |
| 10.0 | 1.4 |
| 20.0 | 1.2 |
| 40.0 | 1.1 |

$CH_4N_2O$ (72, 100)
Urea

| | |
|---|---|
| 0.005 | 1.850 |
| .010 | 1.850 |
| .040 | 1.850 |
| .500 | 1.863 |

$CH_4N_2S$ (241)
Thiourea

| | |
|---|---|
| 0.2 | 1.82 |
| .4 | 1.72 |

$CH_4O$ (1, 17, 162, 213)
Methyl alcohol

| | |
|---|---|
| 0.01 | 1.82 |
| 0.1 | 1.81 |
| 0.2 | 1.81 |
| 2.0 | 1.86 |
| 4.0 | 1.90 |
| 6.0 | 1.93 |
| 10.0 | 2.00 |
| 20.0 | 1.9 |
| 30 | 1.8 |
| 45 | 1.6 |
| 60 | 1.5 |
| 70 | 1.4 |

$C_2HCl_3O_2$ (287)
Trichloroacetic acid

| | |
|---|---|
| 0.005 to 0.04 | 3.5 |

$C_2H_2Cl_2O_2$ (100, 205)
Dichloroacetic acid

| | |
|---|---|
| 0.004 | 3.69 |
| .010 | 3.56 |
| .02 | 3.45 |
| .05 | 3.23 |
| .10 | 3.00 |
| .20 | 2.80 |
| .50 | 2.51 |

$C_2H_2N_8$ (191)
Bistetrazole

| | |
|---|---|
| 0.02 | 3.9 |
| .05 | 3.0 |
| .10 | 2.1 |
| .12 | 1.8 |

$C_2H_2O_4$ (61, 161, 226, 244)
Oxalic acid

| | |
|---|---|
| 0.02 | 3.40 |
| .05 | 3.04 |

$C_2H_2O_4$.—(*Cont'd*)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.10 | 2.84 |
| .20 | 2.64 |
| .30 | 2.58 |

$C_2H_3Br_3O_2$ (7)
Bromal hydrate

| | |
|---|---|
| 0.05 | 1.9 |
| .70 | 1.9 |

$C_2H_3Cl_3O_2$ (1, 162, 241)
Chloral hydrate

| | |
|---|---|
| 0.01 | 1.86 |
| .10 | 1.86 |
| 1.00 | 1.86 |
| 1.50 | 1.89 |
| 2.00 | 1.93 |

$C_2H_4O$ (170)
Ethylene oxide

| | |
|---|---|
| 1.0 | 1.7 |

$C_2H_4O_2$ (1, 54, 69, 137, 237, 241)
Acetic acid

| | |
|---|---|
| 0.1 | 1.90 |
| .3 | 1.86 |
| .7 | 1.81 |
| 1.0 | 1.79 |
| 5.0 | 1.6 |
| 10.0 | 1.4 |
| 18.0 | 1.2 |
| 23.95E | 1.1 |

$C_2H_4O_2$ (1)
Methyl formate

| | |
|---|---|
| 0.3 | 1.87 |
| .5 | 1.82 |
| 1.0 | 1.83 |
| 1.5 | 1.88 |

$C_2H_5NO$ (163)
Acetamide

| | |
|---|---|
| 0.01 | 1.83 |
| .10 | 1.83 |
| .20 | 1.82 |
| 1.00 | 1.81 |

$C_2H_5NO_2$ (142, 241)
Glycocoll

| | |
|---|---|
| 0.1 | 1.85 |
| .3 | 1.80 |
| .6 | 1.74 |
| .9 | 1.69 |

$C_2H_6O$ (1, 162, 213, 227)
Ethyl alcohol

| | |
|---|---|
| 0.02 | 1.83 |
| .1 | 1.83 |
| 1.0 | 1.83 |
| 2.0 | 1.84 |
| 4.0 | 1.93 |
| 6.0 | 2.05 |
| 7.0 | 2.12 |
| 10.0 | 2.2 |
| 15.0 | 2.0 |
| 20.0 | 1.8 |
| 30 | 1.4 |
| 40 | 1.2 |
| 50 | 1.0 |
| 70 | 0.9 |

$C_2H_6O$ (292)
Methyl ether

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.2 | 1.9 |

$C_2H_6OS$ (21)
Thioethylene glycol

$C_2H_7N$ (202)
Ethylamine

| | |
|---|---|
| 0.5 | 1.9 |
| 1.0 | 1.8 |
| 1.5 | 1.8 |

$C_2H_7NO$ (8)
Aldehyde ammonia

| | |
|---|---|
| 0.67 | 0.68* |
| .67 | 0.90† |

* Freezing-point observation taken at once.
† At equilibrium after 27 hours.

$C_3HCl_3O_2$ (27)
Trichloroacrylic acid

| | |
|---|---|
| 0.08 | 3.42 |
| .10 | 3.07 |
| .27E | 2.2 |

$C_3H_6N_2O_2$ (218)
Methylglyoxime

| | |
|---|---|
| 0.1 | 1.8 |

$C_3H_6O$ (1)
Allyl alcohol

| | |
|---|---|
| 0.5 | 1.79 |
| 1.0 | 1.76 |
| 2.0 | 1.77 |
| 3.0 | 1.78 |
| 4.5 | 1.77 |
| 5.0 | 1.76 |
| 6.0 | 1.72 |
| 7.0 | 1.66 |
| 7.5 | 1.62 |

$C_3H_6O$ (1, 162)
Acetone

| | |
|---|---|
| 0.02 | 1.86 |
| 0.10 | 1.85 |
| 1.0 | 1.79 |
| 4.0 | 1.65 |
| 7.0 | 1.52 |

$C_3H_6O_2$ (1, 69, 202)
Propionic acid

| | |
|---|---|
| 0.1 | 2.00 |
| .2 | 1.92 |
| .4 | 1.85 |
| 1.0 | 1.73 |
| 4.0 | 1.39 |
| 8.0 | 1.0 |
| 10.0 | 0.9 |
| 20 | 0.6 |
| 30 | 0.5 |
| 50 | 0.4 |
| 90 | 0.3 |

$C_3H_6O_2$ (1)
Ethyl formate

| | |
|---|---|
| 0.2 | 1.90 |
| 0.4 | 1.92 |
| 1.0 | 1.98 |

$C_3H_6O_2$ (1)
Methyl acetate

| | |
|---|---|
| 0.3 | 1.83 |
| 1.7 | 1.83 |

$C_3H_6O_3$ (137)
$\beta$-Hydroxypropionic acid

| $N_w$ | $\Delta t/N$ |
|---|---|
| 1.0 | 1.85 |
| 2.0 | 1.84 |
| 3.0 | 1.83 |

$C_3H_6O_3$ (137)
Lactic acid

| | |
|---|---|
| 0.5 | 1.96 |
| 1.0 | 1.95 |
| 2.0 | 1.93 |
| 2.5 | 1.92 |

$C_3H_7NO$ (18)
Acetoxime

| | |
|---|---|
| 0.1 | 1.8 |
| 2.0 | 1.6 |

$C_3H_7NO_2$ (171)
Urethane

| | |
|---|---|
| 0.2 | 1.9 |
| .5 | 1.8 |

$C_3H_8O$ (1, 162)
*n*-Propyl alcohol

| | |
|---|---|
| 0.01 | 1.86 |
| .05 | 1.84 |
| .10 | 1.83 |
| .60 | 1.80 |
| 1.00 | 1.79 |
| 1.50 | 1.78 |
| 2.00 | 1.79 |
| 3.00 | 1.82 |
| 3.50 | 1.83 |
| 4.0 | 1.82 |
| 5.0 | 1.76 |
| 6.0 | 1.64 |
| 7.0 | 1.49 |
| 8.0 | 1.32 |

$C_3H_8O$ (1)
Isopropyl alcohol

| | |
|---|---|
| 1.0 | 1.70 |
| 2.0 | 1.73 |
| 3.0 | 1.80 |
| 4.0 | 1.89 |
| 5.0 | 1.98 |
| 6.0 | 2.07 |
| 8.0 | 2.03 |

$C_3H_8O_3$ (1, 102, 154, 162, 223)
Glycerol

| | |
|---|---|
| 0.01 | 1.86 |
| .20 | 1.87 |
| .50 | 1.89 |
| 1.00 | 1.92 |
| 1.20 | 1.93 |
| 1.50 | 1.95 |
| 2.50 | 2.0 |
| 5.0 | 2.1 |
| 13.9E* | 2.0 |
| 22.0E† | 2.1 |

* (223). † (154).

$C_3H_9N$ (202)
Propylamine

| | |
|---|---|
| 0.4 | 2.0 |
| .6 | 1.9 |
| .8 | 1.8 |

$C_4H_4O_4$ (199)
Fumaric and maleic acids

$C_4H_5Cl_3O_2$ (59)
$\alpha$, $\alpha$, $\beta$-Trichlorobutyric acid

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.12 | 3.27 |
| .15 | 3.12 |
| .20 | 3.07 |

$C_4H_5Cl_6NO_2$ (8)
Dihydroxy-bistrichloroethylidene-imine

| | |
|---|---|
| 0.4 | 5.4 |
| .6 | 5.1 |

$C_4H_6O_4$ (161)
Succinic acid

| | |
|---|---|
| 0.01 | 1.99 |
| .05 | 1.93 |
| .10 | 1.89 |
| .20 | 1.88 |

$C_4H_6O_6$ (1, 61, 137, 161)
*d*-Tartaric acid

| | |
|---|---|
| 0.01 | 2.34 |
| .05 | 2.12 |
| .10 | 2.05 |
| .20 | 1.98 |
| .50 | 1.94 |
| .80 | 1.95 |
| 1.50 | 2.01 |
| 3.00 | 2.14 |
| 4.00 | 2.24 |
| 5.00 | 2.35 |

$C_4H_7Cl_3O_2$ (18)
Chloral alcoholate

| | |
|---|---|
| 0.1 | 3.5 |
| 1.0 | 3.0 |

$C_4H_8O_2$ (196)
Glycol ether

| | |
|---|---|
| 0.1 | 1.86 |
| 1.0 | 1.86 |
| 2.0 | 1.85 |
| 5.0 | 1.81 |
| 10.0 | 1.55 |

$C_4H_8O_2$ (69, 202)
*n*-Butyric acid

| | |
|---|---|
| 0.2 | 1.97 |
| .4 | 1.83 |
| .8 | 1.70 |
| 1.0 | 1.67 |
| 1.5 | 1.63 |
| 2.0 | 1.43 |
| 3.0 | 0.89 |
| 4.0 | 0.76 |

$C_4H_8O_2$ (69)
Isobutyric acid

| | |
|---|---|
| 5.0 | 0.170 |
| 15.0 | 0.140 |
| 20.0* | 0.135 |

* Limit of miscibility.

$C_4H_8O_2$ (233)
Ethyl acetate

| | |
|---|---|
| 0.06 | 1.86 |
| .10 | 1.85 |

$C_4H_8O_2$.—(*Cont'd*)

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.20 | 1.83 |
| .50 | 1.82 |
| .60 | 1.82 |

$C_4H_{10}O$ (162)
*n*-Butyl alcohol

| | |
|---|---|
| 0.01 | 1.89 |
| .02 | 1.84 |
| .05 | 1.84 |
| .10 | 1.85 |
| .20 | 1.83 |

$C_4H_{10}O$ (162)
Ethyl ether

| | |
|---|---|
| 0.01 | 1.67 |
| .02 | 1.67 |
| .05 | 1.70 |
| .10 | 1.72 |
| .20 | 1.70 |

$C_4H_{10}O_4$ (93, 223)
Erythritol

| | |
|---|---|
| 0.010 | 1.852 |
| .020 | 1.857 |
| .040 | 1.860 |
| .100 | 1.866 |
| .200 | 1.873 |
| .400 | 1.885 |
| .500 | 1.890 |
| 1.7E | 2.6 |

$C_5H_5N$ (144, 213)
Pyridine

| | |
|---|---|
| 0.1 | 1.79 |
| 0.4 | 1.66 |
| 1.0 | 1.43 |
| 2.0 | 1.15 |
| 2.5 | 1.03 |
| 5.0 | 0.7 |
| 10.0 | 0.5 |
| 15.0 | 0.5 |
| 20.0 | 0.6 |
| 50.0 | 0.90 |

$C_5H_6O_4$ (199)
Citraconic, mesaconic, and itaconic acids

$C_5H_{10}O_5$ (165)
$\beta$,-*l*-Arabinose

$C_5H_{12}O$ (162)
Isoamyl alcohol

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.01 | 1.85 |
| .02 | 1.86 |
| .05 | 1.84 |
| .10 | 1.82 |

$C_5H_{13}N$ (202)
Isoamylamine

| | |
|---|---|
| 0.1 | 1.9 |
| .8 | 1.8 |

$C_6H_3N_3O_7$ (248)
Picric acid

| | |
|---|---|
| 0.005 | 3.82 |
| .010 | 3.63 |
| .020 | 3.28 |
| .0422E | 3.14 |

**$C_6H_6O$ (202, 230, 249)**
Phenol

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.1 | 1.81 |
| .2 | 1.83 |
| .5 | 1.63 |
| .56E* | 1.5 |
| .74mE† | 1.6 |

* Ice and phenol hydrate.
† Ice and phenol.

**$C_6H_6O_2$ (288)**
Resorcinol

**$C_6H_7N$ (162, 202)**
Aniline

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.01 | 1.85 |
| .05 | 1.82 |
| .10 | 1.79 |
| .20 | 1.73 |
| .40 | 1.63 |

**$C_6H_8N_2$ (24)**
Phenylhydrazine

| | |
|---|---|
| 0.3 | 1.4 |
| .5E* | 1.5 |

* Ice and hydrate.

**$C_6H_8O_7$ (1, 137, 147, 161)**
Citric acid

| | |
|---|---|
| 0.01 | 2.26 |
| .02 | 2.14 |
| .05 | 2.08 |
| .10 | 2.03 |
| .50 | 1.93 |
| 1.00 | 1.94 |
| 1.50 | 1.96 |
| 2.00 | 2.00 |
| 3.00 | 2.18 |
| 4.7E | 2.6 |

**$C_6H_{12}O_6$ (162, 241)**
Dextrose

| | |
|---|---|
| 0.05 | 1.86 |
| .10 | 1.86 |
| .20 | 1.87 |
| 40 | 1.89 |
| .80 | 1.91 |
| 1.00 | 1.92 |

**$C_6H_{12}O_6$ (165)**
*α, d*-Galactose

**$C_6H_{12}O_6$ (163)**
Levulose

| | |
|---|---|
| 0.02 | 1.87 |
| .20 | 1.87 |

**$C_6H_{14}O_2$ (18)**
Acetal

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.1 | 1.9 |
| 2.0 | 1.9 |

**$C_6H_{14}O_2$ (223)**
Pinacone

**$C_6H_{14}O_6$ (163, 199)**
Dulcitol

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.01-0.10 | 1.86 |

**$C_6H_{14}O_6$ (4, 28, 93)**
Mannitol

| | |
|---|---|
| 0.005 | 1.853 |
| .010 | 1.854 |
| .020 | 1.855 |
| .040 | 1.856 |
| .050 | 1.857 |
| .070 | 1.858 |
| .1000 | 1.859 |
| .2709 | 1.864 |
| .5460E | 1.866 |

**$C_6H_{15}N$ (202)**
Dipropylamine

| | |
|---|---|
| 0.2 | 1.9 |
| .4 | 1.8 |
| .8 | 1.8 |

**$C_7H_5NO_4$ (287, 289)**
*o*-Nitrobenzoic acid

| | |
|---|---|
| 0.005 | 0.33 |
| .010 | 0.31 |
| .015 | 0.29 |

**$C_7H_9N$ (202)**
Benzylamine

| | |
|---|---|
| 0.1 | 2.1 |
| .2 | 2.0 |
| .3 | 1.9 |
| .5 | 1.6 |

**$C_7H_{10}Cl_2O_5$ (95)**
β-Dechloro-*p*-arabinochloralose

**$C_7H_{14}O_6$ (255)**
α-Methyl glucoside

| | |
|---|---|
| 0.6 | 2.06 |
| 1.0 | 2.16 |
| 2.0 | 2.35 |
| 3.0 | 2.51 |
| 4.0 | 2.64 |
| 4.63E* | 2.72 |

* Ice and anhydrous glucoside.

**$C_8H_{12}Cl_2O_6$ (95)**
β-Dechloro-*p*-galactochloralose

**$C_9H_8O_2$ (176)**
Allocinnamic acid

| M. P. | $N_w$ | $\Delta t/N$ |
|---|---|---|
| 42 | 0.034E | 1.9 |
| 58 | 0.029E | 1.9 |
| 68 | 0.026E | 1.8 |

**$C_{12}H_{22}O_{11}$ (80, 163)**
Maltose

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.05 | 1.87 |
| .20 | 1.89 |
| .40 | 1.92 |
| 1.00 | 2.03 |

**$C_{12}H_{22}O_{11}$ (67, 70, 100, 147, 162, 227, 233, 255)**
Sucrose

| | |
|---|---|
| 0.005 | 1.86 |
| .05 | 1.87 |
| .10 | 1.88 |
| .20 | 1.90 |
| .40 | 1.94 |
| .50 | 1.96 |
| .70 | 2.00 |
| 1.00 | 2.06 |
| 1.20 | 2.10 |
| 1.50 | 2.17 |
| 2.0 | 2.3 |
| 3.0 | 2.5 |
| 4.0 | 2.7 |

**$C_{12}H_{22}O_{11}.H_2O$ (163)**
Lactose

| | |
|---|---|
| 0.01 | 1.86 |
| .10 | 1.86 |
| .20 | 1.88 |

**$C_{12}H_{24}O_{11}$ (260)**
Lactositol

**$C_{13}H_{18}O_7$ (163)**
Salicin

| $N_w$ | $\Delta t/N$ |
|---|---|
| 0.02 | 1.86 |

**$C_{17}H_{22}ClNO_4$ (258)**
Cocaine hydrochloride

**$C_{22}H_{25}NO_6$ (79)**
Colchicine

## Solutions of More Than One Solute

Boric acid + hydrogen peroxide (172)
Boric acid + mannitol (166)
Ethyl alcohol + acetone (70)
Ethyl alcohol + glycerol (70)
Sucrose + glycerol (70)
Sucrose + citric acid (147)
Sucrose + methyl alcohol (1)

## LITERATURE

(For a key to the periodicals see end of volume)


(1) Abegg, *7*, **15**: 209; 94. (2) Abegg and Cox, *7*, **48**: 725; 04. (3) Abegg, Fox and Herz, *93*, **35**: 129; 03. (4) Adams, *1*, **37**: 481; 15. (5) Anthony and Hudleston, *4*, **127**: 1122; 25. (6) Archibald, *292*, **10**: 33; 03. (7) Arrhenius, *7*, **2**: 491; 88. (8) Aschau, *25*, **48**: 874; 15. (9) Bakhuis Roozeboom, *70*, **3**: 29; 84.
(10) Bakhuis Roozeboom, *70*, **4**: 65; 85. (11) Bakhuis Roozeboom, *7*, **2**: 449; 88. (12) Bakhuis Roozeboom, *7*, **10**: 477; 92. (13) Barnes, *292*, **10**: 139; 03. (14) Barth, *7*, **9**: 176; 92. (15) Bassett and Taylor, *4*, **101**: 576; 12. (16) Battelli and Stefanini, *59*, **9**: 5; 99. *6*, **20**: 64; 00. (17) Baume and Borowski, *42*, **12**: 276; 14. (18) Beckmann, *7*, **2**: 715; 88. (19) Beckmann, *7*, **79**: 177; 12.
(20) Bedford, *5*, **83**: 454; 10. (21) Bennett, *4*, **121**: 2139; 22. (22) Benrath, *93*, **54**: 328; 07. (23) Biltz, *7*, **40**: 185; 02. (24) Blanksma, *176*, **7**: 417; 10 (25) Bodländer, *7*, **9**: 730; 92. (26) Bodländer, *Diss.*, Berlin, 1915. *B3*: 1449, 1454. (27) Böeseken and Carrière, *70*, **34**: 179; 15. (28) Braham, *1*, **41**: 1707; 19. (29) Bray, *7*, **54**: 569; 06.
(30) Bruni, *86*, **27 I**: 537; 97. (31) Buchböck, *7*, **23**: 157; 97. (32) Büchner and Prins, *7*, **81**: 113; 12. (33) Burrows and Turner, *4*, **115**: 1429; 19. (34) Buxhoevden and Tammann, *93*, **15**: 319; 97. (35) Calame, *7*, **27**: 401; 98. (36) Calvert, *7*, **38**: 513; 01. (37) Carrara and Gennari, *86*, **24 II**: 484; 94. *22*, **3 II**: 325; 94. (38) Chambers and Frazer, *11*, **23**: 512; 00. (39) Chauvenet, *14*, **13**: 59; 20.
(40) Chistoni, *288*, **40**: 161; 25. (41) Cioci, *93*, **19**: 308; 99. (42) de Coppet, *6*, **25**: 502; 72. (43) de Coppet, *7*, **22**: 239; 97. (44) de Coppet, *50*, **8**: 531; 04. (45) Cornec, *34*, **150**: 108; 10. (46) Cornec, *6*, **29**: 491; 13. (47) Cornec, *6*, **30**: 63; 13. (48) Cornec and Urbain, *27*, **25**: 131; 19. (49) Cornec and Urbain, *27*, **25**: 215; 19.
(50) Cottrell, *50*, **4**: 637; 00. (51) Cottrell, *76*, **1901**: 1035. (52) Cuttica, *36*, **52 I**: 210; 22. (53) Cuttica and Carobbi, *36*, **52 II**: 270; 22. (54) Dahms, *8*, **60**: 119; 97. (55) Dernby, *147*, **3**: No. 18; 16. (56) Dittrich, *7*, **29**: 449; 99. (57) Donnan and Burt, *4*, **83**: 335; 03. (58) Dreyers, *169*, **14**: 229; 10. *10*, **1**: 334; 10. (59) Drucker, *7*, **49**: 563; 04.
(60) Drucker, *9*, **17**: 398; 11. (61) Drucker, *7*, **96**: 381; 20. (62) Drucker, *9*, **28**: 463; 22. (63) Düllberg, *7*, **45**: 120; 03. (64) Dutoit, *42*, **11**: 650; 13. (65) Eggeling and Meyer, *93*, **46**: 174; 05. (66) English and Turner, *4*, **107**: 774; 15. (67) Ewan, *7*, **31**: 22; 99. (68) Falciola, *36*, **39 I**: 398; 09. (69) Faucon, *6*, **19**: 70; 10.
(70) Fawsitt, *4*, **115**: 790; 19. (71) Fernau, *93*, **17**: 327; 98. (72) Flügel, *7*, **79**: 577; 12. (73) Foerster, Brosche and Norberg-Schultz, *7*, **110**: 435; 24. (74) Foote, *11*, **29**: 203; 03. (75) Fraenckel, *93*, **55**: 223; 07. (76) Fricke and Schutzdeller, *93*, **131**: 130; 23. (77) Funk, *93*, **20**: 393; 99. (78) Garelli and Falciola, *36*, **34 II**: 1; 04. (79) Georgievics, *57*, **34**: 1851; 13.
(80) Gillis, *70*, **43**: 135; 24. (81) Giran, *54*, **146**: 1270; 08. (82) Goldblum and Terlikowski, *27*, **11**: 146; 12. (83) Goldschmidt and Syngros, *93*, **5**: 129; 94. (84) Groschuff, *93*, **47**: 331; 05. (85) Grossman and Forst, *93*, **43**: 94; 05. (86) Gutbier, *93*, **29**: 22; 02. (87) Guthrie, *3*, **49**: 1; 75. (88) Guthrie, *3*, **49**: 206; 75. (89) Guthrie, *3*, **49**: 266; 75.
(90) Guthrie, *3*, **1**: 354; 76. (91) Guthrie, *3*, **2**: 211; 76. (92) Guthrie, *3*, **6**: 35; 78. (93) Hall and Harkins, *1*, **38**: 2658; 16. (94) Hammick, Goadby and Booth, *4*, **117**: 1589; 20. (95) Hanriot and Kling, *14*, **12**: 129; 19. (96) Hantzsch and Shibata, *93*, **73**: 309; 12. (97) Harkins, Hall and Roberts, *1*, **38**: 2646; 16. (98) Harkins and Roberts, *1*, **38**: 2676; 16. (99) Hartley and Barrett, *4*, **95**: 1178; 09.
(100) Hausrath, *8*, **9**: 522; 02. (101) Hebb, *292*, **10**: 422; 98. (102) Henkel, *Diss.*, Berlin, 1905. (103) Heyrovsky, *4*, **117**: 1013; 20. (104) Heyrovsky, *135*, **125**: 198; 22. (105) van't Hoff, *7*, **9**: 477; 92. (106) van't Hoff and Meyerhoffer, *7*, **27**: 75; 98. (107) Holt and Myers, *4*, **99**: 384; 11. (108) Hovorka and Rodebush, *1*, **47**: 1614; 25. (109) Isaachsen, *7*, **8**: 145; 91.
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(120) Jones, Barnes and Hyde, *11*, **27**: 22; 02. (121) Jones and Bassett, *11*, **34**: 290; 05. (122) Jones and Caldwell, *11*, **25**: 349; 01. (123) Jones and Carroll, *11*, **28**: 284; 02. (124) Jones and Getman, *7*, **49**: 385; 04. (125) Jones, Getman, Bassett, McMaster and Uhler, *152*, No. **60**: 07. (126) Jones and Knight, *11*, **22**: 110; 99. (127) Jones and Mackay, *11*, **19**: 83; 97. (128) Jones and Murray, *11*, **30**: 205; 03. (129) Jones and Pearce, *11*, **38**: 683; 07.
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(170) Mazzucchelli and Armenante, *36*, **52 I**: 338; 22. (171) Meldrum and Turner, *4*, **97**: 1805; 10. (172) Menzel, *7*, **105**: 402; 23. (173) Menzies and Potter, *1*, **34**: 1452; 12. (174) Meusser, *25*, **35**: 1414; 02. (175) Meyer, *93*, **30**: 113; 02. (176) Meyer, *9*, **17**: 976; 11. (177) Meyerhoffer, *BS*: 658. (178) Meyerhoffer, *BS*: 673. (179) Middelberg, *7*, **43**: 305; 03.
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(270) Taylor, *7*, **27**: 361; 98. (271) Trautz andAnschütz, *7*, **56**: 236; 06. (272) Treadwell and Girsewald, *93*, **38**: 92; 04. (273) Turner and English, *4*, **105**: 1786; 14. (274) Vandenberghe, *93*, **10**: 47; 95. (275) Van Name and Brown, *12*, **44**: 453; 17. (276) Vasilev, *53*, **42**: 423; 10. (277) Vasilev, *53*, **42**: 570; 10. (278) Voerman, *176*, **2**: 766; 05. (279) Walden and Centnerszwer, *7*, **42**: 432; 03.
(280) Walden and Zadwidski, *7*, **54**: 180; 06. (281) Washburn and MacInnes, *9*, **17**: 503; 11. (282) Washburn and MacInnes, *1*, **33**: 1686; 11. (283) Weinland and Büttner, *93*, **75**: 293; 12. (284) Werner, *93*, **15**: 243; 97. (285) Werner and Herty, *7*, **38**: 331; 01. (286) Werner, Müller, Klein and Bräunlich, *93*, **22**: 91; 99. (287) Wildermann, *7*, **15**: 337; 94. (288) Wildermann, *7*, **19**: 233; 96. (289) Wildermann, *7*, **46**: 43; 03.
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# EFFECT OF PRESSURE UPON TRANSITION TEMPERATURES OF CRYSTALLINE HYDRATES, UPON FREEZING POINTS, AND UPON SOLUBILITIES

A. L. Th. Moesveld

## EFFECT OF PRESSURE UPON THE TRANSITION TEMPERATURES OF CRYSTALLINE HYDRATES

| $P$, atm. | $Na_2SO_4$* | $ZnSO_4$† | $SrCl_2$‡ | $Na_2CrO_4$§ |
|---|---|---|---|---|
| 0 | 32.73°C | 38.8°C | 62.3°C | 19.6°C |
| 250 | 32.80 | 39.5 | 63.5 | 18.7 |
| 500 | 32.80 | 40.2 | 64.6 | 17.8 |
| 750 | 32.72 | 40.8 | 65.8 | 16.6 |
| 1000 | 32.57 | 41.5 | 66.9 | 15.3 |
| 1250 | 32.35 | 42.2 | 68.1 | 13.8 |
| 1500 | 32.06 | 42.8 | 69.3 | 12.3 |
| 2000 | 31.25 | | 71.6 | 8.6 |
| 2500 | 30.16 | | 73.9 | +4.3 |
| 3000 | | | | −0.5 |
| Lit. | (1, 6, 7) | (2) | (6) | (6) |

($Na_2SO_4$: + 10 *aq.* + $H_2O$; $ZnSO_4$: + 7 *aq.* + 6 $H_2O$; $SrCl_2$: + 6 *aq.* + 2 $H_2O$; $Na_2CrO_4$: + 10 *aq.* + 6 $H_2O$)

Interpolation equations

$Na_2SO_4 \cdot 10\ aq.$: $t$, °C $= 32.73 + 0.423 \times 10^{-3}P - 0.581 \times 10^{-6}P^2 \pm 0.2$

$ZnSO_4 \cdot 7\ aq.$: $t$, °C $= 38.8 + 2.7 \times 10^{-3}P \pm 0.3$

$SrCl_2 \cdot 6\ aq.$: $t$, °C $= 62.3 + 4.65 \times 10^{-3}P \pm 0.5$

* Extrapolated value for 1 atm. differs slightly from that of Richards and Wells (4).

† Two indirect methods with relatively large error.

‡ Value for 1 atm. not in good agreement with that of Richards and Yngve (5).

§ Equilibrium $P$ rather uncertain

$Na_2CrO_4 \cdot 10\ aq.$: $t$, °C $= 19.6 - 0.31 \times 10^{-3}P - 1.2 \times 10^{-6}P^2 \pm 0.$

For qualitative values on other hydrates, *v.* (3).

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## EFFECT OF PRESSURE UPON FREEZING POINTS OF SOLUTIONS

| Components | | Lit. |
|---|---|---|
| $Ca(NO_3)_2 \cdot 4\ aq.$ | $Cd(NO_3)_2 \cdot 4\ aq.$ | (1) |
| Na | Hg | (7, 9) |
| Benzene | Naphthalene | (2) |
| Benzene | Benzophenone | (2) |
| Benzene | Camphor | (2) |
| Benzene | Urethane | (5) |
| Diphenylamine | *p*-Nitroanisole | (12) |
| Naphthalene | Diphenylamine | (10) |
| Naphthalene | Camphor | (2) |
| Naphthalene | *p*-Toluidine | (3, 4) |
| Naphthalene | Urethane | (3, 4) |
| Naphthalene | *m*-Dinitrobenzene | (11) |
| Urethane | Monobromocamphor | (3) |

| Components | | Lit. |
|---|---|---|
| Urethane | Diphenylamine | (4, 6, 9) |
| Urethane | *p*-Nitroanisole | (8, 9) |
| Monochlorocinnamic ald. | Monobromocinnamic aldehyde | (3) |
| Thymol | *p*-Azoxyanisole | (2) |
| Thymol | *p*-Azoxyphenetole | (2) |
| Thymol | *p*-Toluidine | (2) |
| Phenol | *p*-Toluidine | (2, 12) |
| *m*-Chloronitrobenzene | *m*-Bromonitrobenzene | (5) |

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(10) Roloff, *7*, **17**: 325; 95. (11) Pushin, *7*, **124**: 16; 26. (12) Pushin, *7*, **124**: 217; 26.

## EFFECT OF PRESSURE UPON SOLUBILITY

$\%\ S$ = g of solute per 100 g solution
$\%\ S'$ = g of solute per 100 g solvent

$100x$ = mole % of solute
$\%\ S$ or $100x = (a + b \times 10^{-3}P + c \times 10^{-6}P^2) \pm n$ units

| System | $P$, atm. | 0 | 250 | 500 | 750 | 1000 | 1250 | 1500 | b | c | n | Lit. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $NaCl$ in $H_2O$, 25.0°C. | $\%\ S$ | 26.42 | 26.59 | 26.74 | 26.88 | 27.01 | 27.11 | 27.20 | 0.710 | −0.126 | 0.04 | (1, 5, 11, |
| | $\%\ S'$ | 35.91 | 36.22 | 36.50 | 36.76 | 36.99 | 37.18 | 37.37 | 1.287 | −0.211 | 0.06 | 12, 13, 14, |
| | $100x$ | 9.97 | 10.05 | 10.12 | 10.18 | 10.24 | 10.29 | 10.33 | 0.318 | −0.052 | 0.02 | 15, 16) |
| $Tl_2SO_4$ in $H_2O$, 30.00°C. | $\%\ S$ | 5.80 | 6.64 | 7.45 | 8.25 | 9.02 | 9.78 | 10.51 | 3.38 | −0.160 | 0.03 | (3, 6, 10) |
| | $\%\ S'$ | 6.16 | 7.11 | 8.05 | 8.99 | 9.93 | 10.84 | 11.76 | 3.82 | −0.0598 | 0.04 | |
| | $100x$ | 0.2066 | 0.2357 | 0.2651 | 0.2932 | 0.3211 | 0.3477 | 0.3741 | 0.120 | −0.00563 | 0.001 | |
| $ZnSO_4$ in $H_2O$, 25.0°C. | $\%\ S$ | 36.69 | 36.66 | 36.62 | 36.59 | 36.56 | | | −0.13 | | 0.04 | (9, 11, 13) |
| | $\%\ S'$ | 57.95 | 57.87 | 57.80 | 57.72 | 57.65 | | | −0.30 | | 0.08 | |
| | $100x$ | 6.073 | 6.066 | 6.058 | 6.051 | 6.043 | | | −0.03 | | 0.01 | |
| $CdSO_4$ in $H_2O$, 25.0°C. | $\%\ S$ | 43.44 | 43.65 | 43.82 | 43.97 | 44.08 | | | 0.888 | −0.24 | 0.05 | (9) |
| | $\%\ S'$ | 76.80 | 77.46 | 78.02 | 78.48 | 78.84 | | | 2.85 | −0.8 | 0.10 | |
| | $100x$ | 6.23 | 6.27 | 6.31 | 6.35 | 6.39 | | | 0.16 | | 0.01 | |
| $C_6H_{14}O_6$ (mannitol) in $H_2O$, 24.0°C. | $\%\ S$ | 17.11 | 17.28 | 17.43 | 17.55 | 17.65 | 17.72 | 17.77 | 0.734 | −0.195 | 0.07 | (5) |
| | $\%\ S'$ | 20.64 | 20.87 | 21.06 | 21.23 | 21.37 | 21.49 | 21.59 | 0.945 | −0.210 | 0.08 | |
| | $100x$ | 2.001 | 2.024 | 2.046 | 2.062 | 2.076 | 2.086 | 2.093 | 0.102 | −0.0273 | 0.01 | |
| CdHg in Hg (mix. crys.), 25.00°C. | $\%\ S$ | 5.59 | 5.45 | 5.31 | 5.17 | 5.03 | 4.89 | 4.75 | −0.561 | | 0.01 | (2) |
| | $\%\ S'$ | 5.92 | 5.76 | 5.61 | 5.45 | 5.30 | 5.14 | 4.98 | −0.624 | | 0.01 | |
| | $100x$ | 9.56 | 9.33 | 9.10 | 8.87 | 8.64 | 8.41 | 8.18 | −0.926 | | 0.02 | |

| System | $P$, atm. | 0 | 100 | 200 | 300 | 400 | 500 | b | c | n | Lit. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $CdI_2$ in $H_2O$, 30°C. | $\%\ S$ | 46.79 | 46.40 | 46.01 | 45.62 | 45.24 | 44.85 | −13 | | 0.1 | (4) |
| | $\%\ S'$ | 87.94 | 86.61 | 85.28 | 83.95 | 82.62 | 81.29 | −38.9 | | 0.2 | |
| | $100x$ | 4.146 | 4.086 | 4.025 | 3.965 | 3.904 | 3.844 | − 0.6 | | 0.01 | |
| $Ba(OH)_2$ in $H_2O$, 25°C. | $\%\ S$ | 8.28 | 8.50 | 8.72 | 8.94 | 9.16 | 9.38 | 2.20 | | 0.04 | (14) |
| | $\%\ S'$ | 9.03 | 9.30 | 9.56 | 9.83 | 10.09 | 10.36 | 2.56 | | 0.05 | |
| | $100x$ | 0.528 | 0.543 | 0.559 | 0.574 | 0.590 | 0.605 | 0.154 | | 0.003 | |
| *m*-$C_6H_4(NO_2)_2$ in $CH_3CO_2C_2H_5$, 30°C. | $\%\ S$ | 34.44 | 33.31 | 32.24 | 31.23 | 30.27 | 28.38 | −11.62 | 3.00 | 0.01 | (8) |
| | $\%\ S'$ | 52.54 | 49.96 | 47.59 | 45.40 | 43.42 | 41.63 | −26.73 | 9.82 | 0.02 | |
| | $100x$ | 21.590 | 20.748 | 19.959 | 19.222 | 18.537 | 17.905 | − 8.678 | 2.61 | 0.007 | |

$C_{10}H_8$ in $C_2H_2Cl_4$ at 30.00°C: $\log_{10}\ \%\ S' = (1.73224 - 0.39974 \times 10^{-3}P + 0.08949 \times 10^{-6}P^2) \pm 0.05$. $\log_{10}(100x) = (1.61764 - 0.24196 \times 10^{-3}P + 0.03432 \times 10^{-6}P^2) \pm 0.03$ (7). $\log_{10}\ \%S = (1.54504 - 0.26840 \times 10^{-3}\ P + 0.04320 \times 10^{-6}\ P^2) \pm 0.02$.

| $P$ atm. | 0 | 250 | 500 | 750 | 1000 |
|---|---|---|---|---|---|
| $\%\ S$ | 35.08 | 30.24 | 26.40 | 23.34 | 20.89 |
| $\%\ S'$ | 53.98 | 43.44 | 35.87 | 30.39 | 26.42 |
| $100x$ | 41.46 | 36.25 | 32.01 | 28.54 | 25.71 |

### LITERATURE REFERENCES TO DATA ON OTHER SALTS

In $H_2O$: $NH_4Cl$ (1, 12, 13, 15, 16); $Na_2SO_4$ (11); $Na_2CO_3$ (13); $KClO_3$ (13); $K_2SO_4$ (11, 12, 15); $KNO_3$ (13); $K_3Fe(CN)_6$, $K_4Fe(CN)_6$ (12); $KAl(SO_4)_2$ (16); $CuSO_4$ (12, 15).

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# FREEZING POINT—SOLUBILITY DATA. THREE-COMPONENT SYSTEMS CONTAINING A NON-METALLIC ELEMENTARY SUBSTANCE

T. R. Briggs (Assisted by L. Greiff and F. H. Rhodes)

### Abbreviations

M Mole = gram molecular weight.
$l_s$ Liter of solution at temperature of experiment.
[X] Concentration of constituent X in the units stated.
→ or ↓ Linear relation over the range so marked.
All temperatures given in °C.

## AQUEOUS SYSTEMS

**A-B Table, Standard Arrangement; A = $H_2O$; B = The Elementary Substance**

**$Br_2$**

C = $HgBr_2$ [18]

| 25° | | Solid C → | | | C + B (liq.) |
|---|---|---|---|---|---|
| | [B], $10^{-3}$ M/$l_s$ | 0 | 75.3 | 180 | 223 |
| | [C], $10^{-3}$ M/$l_s$ | 17.0 | 18.4 | 19.5 | 21.2 |

C = **KBr,** solid phase KBr; accuracy *ca.* ± 1%; density given [20.5]

| 32.4° | [B], M/$l_s$ | 0 | 1.0 | 1.5 | 1.715 | 28° | 9.45 | 14.2 |
|---|---|---|---|---|---|---|---|---|
| | | → | | | | | | |
| | [C], M/$l_s$ | 4.916 | 5.039 | 5.085 | 5.104 | | 6 20 | 3.63 |

**$I_2$**

Solid phase = $I_2$; $t$ = 25° [24]

| C | Before Saturation [C], M/$l_s$ | After Saturation [B], $10^{-3}$ M/$l_s$ | C | Before Saturation [C,] M/$l_s$ | After Saturation [B], $10^{-3}$ M/$l_s$ |
|---|---|---|---|---|---|
| Nil | 0 | 1.10 | $NaNO_3$† | 1.00 | 1.02 |
| $H_3BO_3$ | 0.30 | 1.18 | $KNO_3$ | 1.00 | 1.05 |
| NaCl*† | 1.00 | 2.26 | $NH_4NO_3$ | 1.00 | 1.21 |
| KCl* | 1.00 | 2.63 | $Na_2SO_4$*† | 0.25 | 0.82 |
| $NH_4Cl$ | 1.00 | 2.89 | $K_2SO_4$ | 0.25 | 0.94 |
| NaBr | 1.00 | 12.9‡ | $(NH_4)_2SO_4$ | 0.25 | 0.97 |
| KBr* | 1.00 | 14.9‡ | $NH_4C_2H_3O_2$ | 1.00 | 1.75 |
| $NH_4Br$ | 1.00 | 15.7 | $(NH_4)_2C_2O_4$ | 0.35 | 3.88 |

* Data for other temperatures also given.
† *See* [6] for data at 25 and 30°; also gives data for $NaH_2PO_4$.
‡ *Cf.* p. 267.

The following tables are arranged in order of the C-constituent in accordance with the standard arrangement (*v.* Vol. III, p. viii).

C = **HX;** solid phase = $I_2$; accuracy, ±1–2% [28]; [C] in M/$l_s$; [B] in $10^{-3}$ M/$l_s$; $t$ = 25.2 ± 0.2°

| C = HCl [C] | [B] | HBr [B] | HI [B] | C = HCl [C] | [B] | HBr [B] |
|---|---|---|---|---|---|---|
| 0 | 1.31 | 1.31 | 1.31 | 1.0 | 2.35 | 15.8 |
| 0.1 | 1.39 | 2.55 | 50.0 | 1.5 | 3.14 | 24.9 |
| 0.2 | 1.46 | 3.80 | 104 | 2.0 | 4.10 | 35.0 |
| 0.3 | 1.54 | 5.04 | 159 | 2.5 | 5.00 | 45.6 |
| 0.4 | 1.62 | 6.40 | 219 | 3.0 | 5.90 | 56.7 |
| 0.5 | 1.71 | 7.80 | 292 | 3.5 | 6.75 | 69.1 |
| 0.6 | 1.82 | 9.25 | 369 | 4.0 | 7.51 | 82.2 |
| 0.8 | 2.07 | 12.4 | | | | |

C = $HNO_3$ or $H_2SO_4$; solid phase = $I_2$; $t$ = 10, 25 and 35° [6]

C = $C_2H_5OH$; solid phase = $I_2$; $t$ = 15°; accuracy *ca.* ±1–3% [34]; *cf. below*

| Wt. % C in $H_2O$ | g B/100 g (A + C) | Wt. % C in $H_2O$ | g B/100 g (A + C) | Wt. % C in $H_2O$ | g B/100 g (A + C) |
|---|---|---|---|---|---|
| 0 | 0.025 | 35 | 0.34 | 70 | 4.43 |
| 5 | 0.033 | 40 | 0.58 | 75 | 5.73 |
| 10 | 0.045 | 45 | 0.88 | 80 | 7.20 |
| 15 | 0.062 | 50 | 1.30 | 85 | 9.00 |
| 20 | 0.085 | 55 | 1.80 | 90 | 11.3 |
| 25 | 0.122 | 60 | 2.47 | 95 | 14.6 |
| 30 | 0.186 | 65 | 3.35 | 100 | 19.6 |

$t$ = 25°; accuracy *ca.* 1% [24]; % C = Wt. % C in $H_2O$; [B] in $10^{-3}$ M/$l_s$

| % C | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [B] | 1.1 | 1.6 | 2.7 | 6.6 | 20.5 | 50 | 107 | 196 | 340 | 549 | 795 |

C = $CH_3COOH$; solid phase = $I_2$; 25° [24]

| Wt. % C in $H_2O$ | 0 | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|---|
| [B], $10^{-3}$ M/$l_s$ | 1.10 | 1.65 | 2.50 | 3.45 | 5.75 | 9.65 |
| Wt. % C in $H_2O$ | 60 | 70 | 80 | 90 | 100 | |
| [B], $10^{-3}$ M/$l_s$ | 16.0 | 25.2 | 42.2 | 70.2 | 102.5 | |

C = $C_3H_5(OH)_3$ Glycerol; solid phase = $I_2$; 25° [17]; *v. further* p. 398

| Wt. % C in $H_2O$ | [B], $10^{-3}$ M/$l_s$ | Wt. % C in $H_2O$ | [B], $10^{-3}$ M/$l_s$ | Wt. % C in $H_2O$ | [B], $10^{-3}$ M/$l_s$ |
|---|---|---|---|---|---|
| 0 | 1.2 | 40 | 3.4 | 80 | 19.4 |
| 10 | 1.6 | 50 | 5.1 | 90 | 31.3 |
| 20 | 2.0 | 60 | 7.7 | 100 | 48.5 |
| 30 | 2.4 | 70 | 11.9 | Density given | |

C = $C_2H_5OH$ Ethyl alcohol or $C_3H_7OH$ *n*-Propyl alcohol; $t$ = 14.5 −15.1°; [C] = Vol % C in A + C; [B] = $10^{-3}$M/$l_s$; solid phase = $I_2$ [5].

| [C] | EtOH [B] ± 1–2% | PrOH [B] ± 1–2% | [C] | EtOH [B] ± 1–2% | PrOH [B] ± 1–2% |
|---|---|---|---|---|---|
| 10 | | 1.9 | 60 | 45 | 107 |
| 20 | 2 | 4.2 | 70 | 91 | 161 |
| 30 | 4 | 15.6 | 80 | 167 | 236 |
| 40 | 10 | 37 | 90 | 294 | 360 |
| 50 | 22 | 64 | 100 | 617 | 588 |

C = $(C_2H_5)_2O$ Ethyl ether; solid phase = $I_2$; $t$ = *ca.* 16.6° [36]; [X] in M/$l_s$; up to [A] = 0.440, [B] = 0.2675 [A] + 0.812, and at [A] = 0.471, [B] = 0.990.

C = $PbI_2$; 20° [11.5]. A solution saturated with both B and C has [C] = $2.16 \times 10^{-3}$ M/$l_s$.

C = $HgCl_2$; solid phase = $I_2$; 25°; accuracy *ca.* ±1% [18]; [X] in $10^{-3}$M/$l_s$.

| [C]... | 0 | 50 | 100 | 150 | 200 | 250 | 300 | 334.6 |
|---|---|---|---|---|---|---|---|---|
| [B]... | 1.34 | 9.0 | 13.2 | 16.0 | 18.2 | 20.5 | 23.4 | 25.43 |

## $I_2$.—(*Continued*)

C = **CuI** ($2\ CuI + I_2 \rightleftarrows 2\ CuI_2$); 20 ± 0.3°; [X] in $10^{-3}$ M/$l_s$ (11)

| [$I_2$] | [Cu] | [$I_2$] | [Cu] |
|---|---|---|---|
| Solid: CuI | | Solids: $I_2$ + CuI | |
| 2 | 4.00 | 29.94 | 19.37 |
| 4 | 6.51 | Solid: $I_2$ | |
| 6 | 8.21 | [$I_2$] = 1.15 + 1.482 [Cu] up to [Cu] = 19.4 | |
| 8 | 9.50 | | |
| 10 | 10.61 | Accuracy 0.2–0.4% | |
| 15 | 12.99 | | |
| 20 | 15.15 | | |
| 25 | 17.27 | | |

Solid $I_2$ + solid CuI at various temperatures

| °C | [$I_2$] | [Cu] | Lit. |
|---|---|---|---|
| 0 | 21.53 | 14.54 | (11) |
| 20 ± 0.3 | 29.94 | 19.37 | (11) |
| 25 | 32.22 | 20.70 | (3) |
| 40 | 44.80 | 26.07 | (11) |

C = **$BaI_2$**; 25°; solid phase = $I_2$; [X] in M/1000 g $H_2O$; accuracy ±0.2–1% (31)

| [$BaI_2$] | [$I_2$] | [$BaI_2$] | [$I_2$] | [$BaI_2$] | [$I_2$] |
|---|---|---|---|---|---|
| 0.0 | 0.00133 | 0.2 | 0.210 | 0.8 | 1.29 |
| 0.05* | 0.0506 | 0.4 | 0.470 | 1.0 | 1.78 |
| 0.1 | 0.102 | 0.6 | 0.845 | 1.192 | 2.288 |

* For values <0.05, *v.* (31).

C = **NaI**; solid phase = $I_2$; [X] in M/$l_s$ (15). At 25° and up to [NaI] = 1.44, [$I_2$] = 0.0013 + 0.588 [NaI], ±0.2–0.5%; $d_s$ = density of the saturated solution at 25°/4° up to [NaI] = 1.0, $d_s$ = 0.999 + 0.202 [NaI], ±0.03–0.1%; at [NaI] = 1.44, $d_s$ = 1.2959. $y^{t°}$ = grams $I_2$ dissolved by 100 g NaI solution containing $x$ % NaI at $t$°; at 25° and up to $x$ = 20, $y = 0.993x + 0.033$, ±0.1–0.2%; between $t$ = 15° and $t$ = 60°, when $x$ = 10, $y = y_o + 0.0705(t–t_o)$, ±0.2–0.5%; between $t$ = 20° and $t$ = 60°, when $x$ = 20, $y = y_o + 0.142(t–t_o)$, ±0.4–1%.

C = **NaBr**; 25°; [X] in M/$l_s$; accuracy 0.3–1% (2)

| [NaBr] | [$I_2$] | [NaBr] | [$I_2$] |
|---|---|---|---|
| Solid: $I_2$ | | Solid: $I_2$ | |
| 0 | 0.00133 | 5.0 | 0.0324 |
| 0.5 | 0.0082 | 6.0 | 0.0313 |
| 1.0 | 0.0138 | 7.0 | 0.0287 |
| 2.0 | 0.0225 | Solids: $I_2$ + NaBr | |
| 3.0 | 0.0284 | | |
| 4.0 | 0.0315 | 7.35 | 0.0275 |

C = **KBr**; 25°; [X] in M/$l_s$; accuracy 0.3–1% (2)

| [KBr] | [$I_2$] | [KBr] | [$I_2$] |
|---|---|---|---|
| Solid: $I_2$ | | Solid: $I_2$ | |
| 0 | 0.00133 | 3.0 | 0.0381 |
| 0.5 | 0.0086 | 3.5 | 0.0432 |
| 1.0 | 0.0152 | 4.0 | 0.0480 |
| 1.5 | 0.0214 | Solids: $I_2$ + KBr | |
| 2.0 | 0.0273 | | |
| 2.5 | 0.0328 | 4.77 | 0.0547 |

**C = KI**; solubility of $I_2$ in dilute KI solutions; [X] in $10^{-3}$ M/$l_s$: at 0° and up to [KI] = 50, [$I_2$] = 0.638 + 0.472 [KI], and for [KI] = 100, [$I_2$] = 48.33; accuracy ±0.2%; $d_4^0$ also given (19); at 25° and up to [KI] = 50, [$I_2$] = 1.33 + 0.495 [KI], and for [KI] = 100, [$I_2$] = 51.6; accuracy ±0.5–1% (3, 27). Solubility of KI in $I_2$ solutions; [X] in M/$l_s$: at 25° and up to [$I_2$] = 5.0, [KI] = 6.27–0.105 [$I_2$]; also $d_4^{25} = 1.728 + 0.180$ [$I_2$] (30).

C = **KI**.—(*Continued*)

Solubility of $I_2$ and of KI; [X] in M/$l_s$; 25°; *see* Fig. 1

| [KI] | [$I_2$] | Lit. and remarks | [KI] | [$I_2$] | Lit. and remarks |
|---|---|---|---|---|---|
| Solid: $I_2$ | | | Solids: $I_2$+KI | | |
| 0.0 | 0.00133 | (3) | 5.18 | 8.87 | ±0.5–1% |
| 0.1 | 0.0516 | (27) | Solid: KI | | |
| 0.2 | 0.106 | | 6.27 | 0.0 | |
| 0.3 | 0.164 | | 6.16 | 1.0 | |
| 0.4 | 0.226 | ±0.5–1% (22) | 6.06 | 2.0 | |
| 0.5 | 0.295 | | 5.96 | 3.0 | |
| 0.6 | 0.368 | | 5.85 | 4.0 | ±0.5–1% (30) |
| 0.7 | 0.445 | | 5.75 | 5.0 | |
| 0.8 | 0.524 | | 5.76 | 7.97 | |
| 0.9 | 0.610 | ±1–3% (22, 30) | 5.44 | 8.47 | |
| 1.0 | 0.700 | | | | |
| 1.5 | 1.22 | | | | |
| 2.0 | 1.83 | | | | |
| 3.0 | 3.69 | ±0.5–1% (30) | | | |
| 4.0 | 6.21 | | | | |
| 5.0 | 8.60 | | | | |

For effect of additions of $C_2H_5OH$, *v.* (29). For reported existence of solid periodides, *v.* (1, 14).

Temperature coefficient of solubility of $I_2$; [X] in M/$l_s$

| | [KI] | a |
|---|---|---|
| $[I_2]_t = [I_2]_o + a \times 10^{-3}(t–t_o)$; range, 10 to 45°; accuracy ±1–2% (12) | 0.10 | 0.265 |
| | 0.333 | 1.03 |
| | 0.50 | 1.27 |

C = **$KN_3$**, 30°; [X] in M/$l_s$; accuracy *ca.* ±1% (4)

| [$KN_3$]* | [$I_2$] | [$KN_3$]* | [$I_2$] |
|---|---|---|---|
| Solid: $I_2$ | | Solid: $I_2$ | |
| 0.0 | 0.00179 | 3.0 | 0.0653 |
| 0.2 | 0.00543 | 4.0 | 0.0886 |
| 0.4 | 0.00930 | 5.0 | 0.109 |
| 0.6 | 0.0133 | Solids: $I_2$ + $KN_3$ | |
| 0.8 | 0.0174 | 5.53 | 0.1197 |
| 1.0 | 0.0216 | | |
| 2.0 | 0.0430 | | |

* Before saturation with $I_2$.

C = **RbI**; 25°; equilibrium possibly not completely established; nature of solid phases not determined with certainty (14)

| Solid | RbI | RbI + $RbI_3$ | $RbI_3$ | | $RbI_3$ + $I_2$ |
|---|---|---|---|---|---|
| % $I_2$ | 0 | 5.90 | 8.02 | 38.08 | 65.02 |
| % RbI | 61.93 | 59.94 | 57.24 | 33.89 | 27.92 |

C = **CsI**; composition of solid phases uncertain (13, 14)

Composition of the single liquid phase

| °C | % CsI | % $I_2$ | °C | % CsI | % $I_2$ |
|---|---|---|---|---|---|
| | CsI + ice | | | $CsI_3$ + $CsI_5$ + ice | |
| −4.0 | 27.69 | 0 | −0.4 | 3.18 | 0.32 |
| | CsI + $CsI_3$ + ice | | | $CsI_5$ + $I_2$ + ice | |
| (−4.0) | 27.52 | 0.09 | −0.2 | 0.85 | 0.34 |
| | CsI | | | $CsI_3$ + $CsI_5$ | |
| 35.6 | 51.48 | 0 | 25.0 | 7.71 | 1.19 |
| | CsI + $CsI_3$ | | 35.6 | 10.73 | 1.81 |
| 35.6 | 51.67 | 0.71 | 52.2 | 16.79 | 4.52 |
| | $CsI_5$ + $I_2$ | | 72.6 | 26.98 | 15.08 |
| 25.0 | 2.38 | 1.24 | | | |
| 35.6 | 3.74 | 1.60 | | | |

C = CsI.—(*Continued*)

Compositions of the two liquid phases

| | $L_1$ | | $L_2$ | |
|---|---|---|---|---|
| °C | % CsI | % $I_2$ | % CsI | % $I_2$ |
| | $CsI_5 + I_2 + L_1 + L_2$ | | | |
| 51.5 | Compositions not determined | | | |
| | $CsI_5 + L_1 + L_2$ | | | |
| 52.2 | 6.72 | 3.33 | 22.94 | 73.72 |
| 72.6 | 16.67 | 10.51 | 27.58 | 68.41 |
| | $I_2 + L_1 + L_2$ | | | |
| 52.2 | 6.65 | 3.45 | 22.80 | 74.63 |
| 72.6 | 6.27 | 4.08 | 17.68 | 80.02 |

## S

C = $(CH_3)_2CO$; 25°; solubility of "sulfur" in mixtures of acetone and water containing % C of acetone; [S] in $10^{-3}$ g-atoms/$l_s$ (17)

| Wt. % C..... | 85 | 90 | 95 | 100 |
|---|---|---|---|---|
| [S]..... | 7.80 | 10.12 | 13.80 | 20.26 |

$d_4^{25}$ of solutions also given.

C = $Na_2S$; 25°; accuracy 0.1–0.2%; solid S, prepared by crystallization from $CS_2$; [X] in M/(l of A + C) (21)

| [$Na_2S$] | [S] | [$Na_2S$] | [S] | [$Na_2S$] | [S] |
|---|---|---|---|---|---|
| 0.005 | 0.0185 | 0.05 | 0.2115 | 0.5 | 1.923 |
| 0.01 | 0.0407 | 0.1 | 0.4145 | 1.0 | 3.666 |
| 0.02 | 0.0839 | 0.2 | 0.8080 | 2.0 | 6.950 |
| 0.03 | 0.1273 | 0.3 | 1.182 | | |

Temperature coefficient of solubility

| [$Na_2S$] = | $t$, °C | 0 | 17 | 25 | 50 |
|---|---|---|---|---|---|
| 0.5 | [S] | 1.9198 | 1.9186 | 1.9180 | 1.9125 |

C = $K_2S$ (35)

## NON-AQUEOUS SYSTEMS

$Cl_2 + SO_2 + SO_2Cl_2$; A = $Cl_2$, B = $SO_2$, C = $SO_2Cl_2$ (16)

| Solid phase | A + B | B + C | A + C | A + B + C |
|---|---|---|---|---|
| $t$, °C..... | −102.4±0.1 | −84.5±0.1 | −109.1±0.1 | −111.6±0.2 |
| % B..... | 3 | 71.5 | 0 | 8 |
| % C..... | 0 | 28.5 | 22.7 | 16 |

Also first and second temperature arrests for 4 ternary solutions.

$Br_2 + C_6H_5NO_2 + KBr$; 28.5°; solid phase = KBr; [X] in M/$l_s$; accuracy ±1–2% (20)

| [$Br_2$] | [KBr] | [$Br_2$] | [KBr] | [$Br_2$] | [KBr] |
|---|---|---|---|---|---|
| 0.1 | 0.051 | 0.6 | 0.225 | 1.2 | 0.407 |
| 0.2 | 0.088 | 0.8 | 0.288 | 1.4 | 0.460 |
| 0.4 | 0.159 | 1.0 | 0.350 | 1.535 | 0.494 |

**$I_2$ + Two Organic Compounds.** System: $I_2 + CHCl_3 + (C_2H_5)_2O$; 25°; solid phase = $I_2$; solvent: ether + chloroform; accuracy ±0.2–0.5% (25).

| [$(C_2H_5)_2O$] Wt. % in solvent | [$I_2$] M/1000 g solvent | [$(C_2H_5)_2O$] Wt. % in solvent | [$I_2$] M/1000 g solvent |
|---|---|---|---|
| 0 | 0.122 | 60 | 0.642 |
| 10 | 0.170 | 70 | 0.796 |
| 20 | 0.226 | 80 | 0.970 |
| 30 | 0.296 | 90 | 1.166 |
| 40 | 0.387 | 100 | 1.383 |
| 50 | 0.500 | | |

Systems: $I_2$ + various organic liquids; $t$ = *ca.* 16.6°; solid phase = $I_2$; [X] in M/$l_s$ (36)

| B | A | [A] | [$I_2$] |
|---|---|---|---|
| $CS_2$..... | $CHCl_3$ | 0 | 0.703 |
| | | 0.419 | 0.804 |
| $CS_2$..... | $C_2H_5OH$ | 0.456 | 0.7965 |
| | | 0.911 | 0.855 |
| | $(C_2H_5)_2O$ | Up to [A] = 0.609, [$I_2$] = 0.7029 + 0.1438 [A] | |
| $(C_2H_5)_2O$..... | $C_6H_6$ | 0 | 0.812 |
| | | 1.029 | 0.804 |
| | $CHCl_3$ | 0.399 | 0.769 |
| | $C_2H_5OH$ | Up to [A] = 0.638, [$I_2$] = 0.812 + 0.2310 [A] and when [A] = 0.851, [$I_2$] = 1.0015 | |
| | $CH_3I$ | 0.548 | 0.867 |

$t$ = 14.5–15.1°; solid $I_2$; solvent = A + B; [X] in M/$l_s$; accuracy ±1–2% (5)

| Vol % B/(A + B) solvent | A = $CHCl_3$ | | | | A = $CCl_4$ | |
|---|---|---|---|---|---|---|
| | B = $C_6H_6$ | $CS_2$ | $C_2H_5OH$ | *n*-$C_3H_7OH$ | $C_6H_6$ | $CS_2$ |
| | [$I_2$] | [$I_2$] | [$I_2$] | [$I_2$] | [$I_2$] | [$I_2$] |
| 0 | 0.143 | 0.143 | 0.143 | 0.143 | 0.081 | 0.081 |
| 10 | 0.160 | 0.170 | 0.171 | 0.182 | 0.105 | 0.102 |
| 20 | 0.176 | 0.208 | 0.199 | 0.218 | 0.134 | 0.133 |
| 30 | 0.192 | 0.253 | 0.227 | 0.250 | 0.161 | 0.177 |
| 40 | 0.212 | 0.304 | 0.246 | 0.279 | 0.193 | 0.218 |
| 50 | 0.239 | 0.358 | 0.261 | 0.308 | 0.226 | 0.272 |
| 60 | 0.271 | 0.420 | 0.279 | 0.318 | 0.261 | 0.337 |
| 70 | 0.307 | 0.483 | 0.307 | 0.355 | 0.296 | 0.407 |
| 80 | 0.346 | 0.551 | 0.340 | 0.436 | 0.333 | 0.486 |
| 90 | 0.380 | 0.622 | 0.373 | 0.520 | 0.372 | 0.569 |
| 100 | 0.411 | 0.693 | 0.617 | 0.588 | 0.411 | 0.693 |

**$I_2$ + One Organic Compound + a Halide;** $t$ = 16–17°; $I_2$ + KI; [X] in M/$l_s$; accuracy *ca.* ±1% (7)

| Solvent | Solid: $I_2$ | | Solid: KI | |
|---|---|---|---|---|
| | [KI] | [$I_2$] | [$I_2$] | [KI] |
| Ethyl acetate..... | 0 | 0.555 | 0 | 0.077 |
| | 0.81 | 3.16 | 0.386 | 0.396 |
| Ethyl alcohol..... | 0 | 0.882 | 0 | 0.087 |
| | 0.66 | 2.47 | 0.38 | 0.413 |
| Ethyl bromide..... | 0 | 0.831 | 0 | 0 |
| | 0.46 | 2.44 | 0.394 | 0.113 |
| Ethyl cyanide..... | 0 | 0.433 | 0 | 0.024 |
| | 0.645 | 2.52 | 0.372 | 0.392 |
| Isobutyl alcohol..... | 0 | 0.307 | 0 | 0 |
| | 0.353 | 1.22 | 0.379 | 0.317 |
| *o*-Nitroanisole..... | 0 | | 0 | |
| | 0.360 | 1.40 | 0.301 | 0.302 |
| Nitropentane..... | 0 | | 0 | |
| | 1.06 | 3.72 | 0.796 | 0.583 |
| Trichloronitromethane..... | | | 0 | |
| | | | 0.26 | 0.04 |

Solubility of halides in $I_2$ dissolved in organic nitro-compounds; $t$ = 16–17°; [X] in M/$l_s$; accuracy ±0.5–2%; composition of solid phases uncertain (7, 8, 9)

| Nitromethane | | *o*-Nitrotoluene | | *m*-Nitrotoluene | Nitrobenzene | | | |
|---|---|---|---|---|---|---|---|---|
| [$I_2$] | [KI] | [KI] | [CsI] | [KI] | [KBr] | [NaI] | [RbI] | [KI] |
| 0 | (0) | (0) | (0) | (0) | (0) | (0) | (0) | (0) |
| 0.2 | 0.212 | 0.185 | 0.189 | 0.180 | 0.095 | 0.192 | 0.195 | 0.200 |
| 0.4 | 0.413 | 0.338 | 0.348 | 0.330 | 0.162 | 0.345 | 0.367 | 0.365 |
| 0.6 | 0.607 | 0.467 | 0.484 | 0.452 | 0.226 | 0.472 | 0.515 | 0.515 |
| 0.8 | 0.800 | 0.581 | | 0.558 | 0.289 | 0.582 | 0.655 | 0.650 |
| 1.0 | 0.983 | 0.680 | | 0.653 | 0.346 | 0.672 | 0.778 | 0.756 |

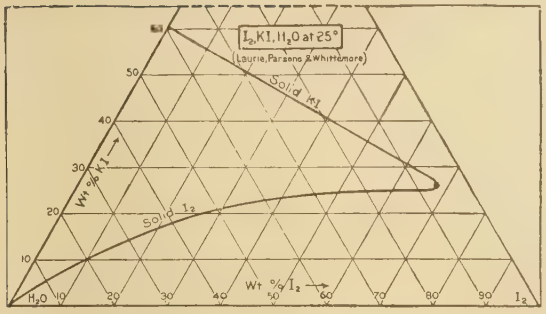



FIG. 1.

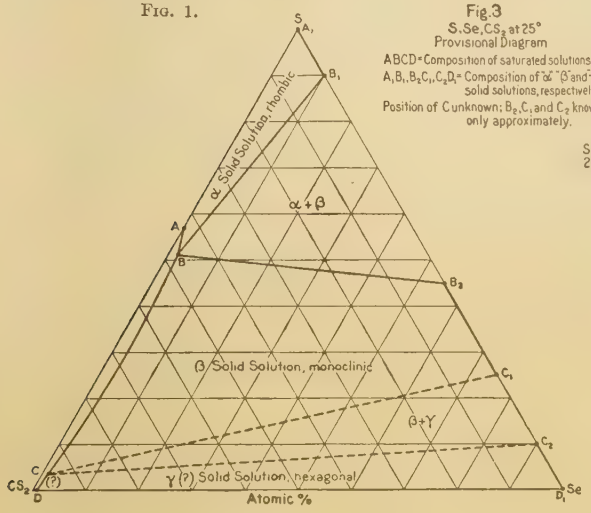
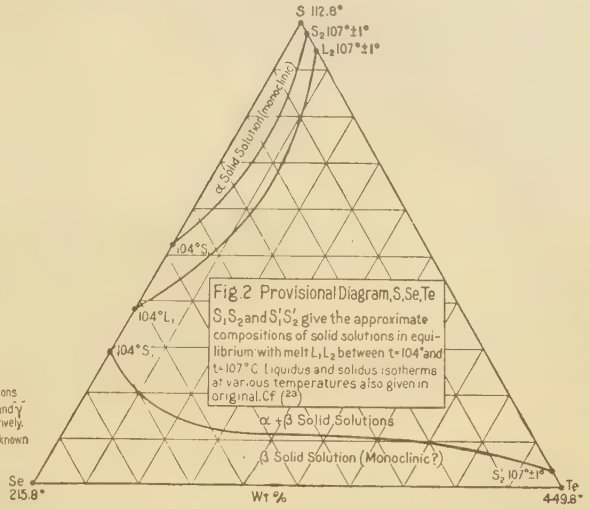
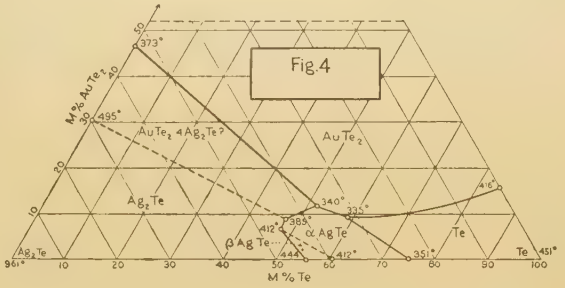



**Fig.3**
S,Se,$CS_2$ at 25°
Provisional Diagram
ABCD = Composition of saturated solutions
$A_1B_1C_1C_2D_1$ = Composition of α, β and γ solid solutions, respectively.
Position of C unknown; $B_2$, $C_1$ and $C_2$ known only approximately.




Solubility of halides in $I_2$ dissolved in organic nitro-compounds; $t$ = 16–17°; [X] in M/l$_n$; accuracy ± 0.5–2 %; composition of solid phases uncertain (7, 8, 9).—*(Continued)*

| Nitromethane | | *o*-Nitrotoluene | | *m*-Nitro-toluene | Nitrobenzene | | | |
|---|---|---|---|---|---|---|---|---|
| [$I_2$] | [KI] | [KI] | [CsI] | [KI] | [KBr] | [NaI] | [RbI] | [KI] |
| 1.5 | 1.39 | 0.887 | For CsI + | 0.861 | 0.484 | 0.875 | 1.04 | 0.960 |
| 2.0 | | 1.06 | $CsI_3$? † | 1.04 | 0.605 | 1.05 | 1.25 | 1.14 |
| 2.5 | | 1.21 | [$I_2$] = | | | 1.21 | | |
| 3.0 | | 1.34 | 0.617 | | | 1.34 | | |
| 3.5 | | | and [CsI] | | | 1.43 | | |
| 2.52* | | | = 0.494 | | 0.71 | | | |

* Saturated. † Solid phases.

| Nitrobenzene | | | | | | | |
|---|---|---|---|---|---|---|---|
| [$I_2$] | [LiI]* | [$BaI_2$] | [$(CH_4)_4$-NI] | [$SrI_2$] | [KCl] | [RbCl] | [CsCl] |
| 0 | 0.380 | (0) | (0) | (0) | (0) | (0) | (0) |
| 0.2 | 0.620 | 0.07$_1$ | 0.202 | 0.08$_7$ | 0.030 | 0.044 | 0.080 |
| 0.4 | 0.836 | 0.13$_5$ | 0.394 | 0.17$_0$ | | | |
| 0.6 | 1.05 | 0.19$_3$ | 0.570 | | | | |
| 0.8 | 1.25 | 0.24$_8$ | | | | | |

AgI and $CdI_2$ insoluble.
* Solid phase probably LiI.$C_6H_5NO_2$.

Solubility of $I_2$ in halides dissolved in organic nitro-compounds; $t$ = 16–17°; [X] in M/l$_n$; accuracy ±0.5–2% (7, 8, 9)

| Nitromethane | | *o*-Nitro-toluene | | *m*-Nitro-toluene | | Nitrobenzene | | |
|---|---|---|---|---|---|---|---|---|
| Hal. = | KI | KI | CsI | KI | NaI | KI | KBr | LiI |
| [Hal.] | [$I_2$] | [$I_2$] | [$I_2$] | [$I_2$] | [$I_2$] | [$I_2$] | [$I_2$] | [$I_2$] |
| 0 | | | | | 0.200 | 0.200 | 0.200 | 0.200 |
| 0.1 | | | 0.5$_1$ | | 0.523 | 0.541 | 0.530 | 0.5$_3$ |
| 0.2 | | | 0.9$_1$ | | 0.852 | 0.893 | 0.858 | 0.8$_7$ |
| 0.3 | | 1.22 | 1.2$_6$ | 1.2$_4$ | 1.21 | 1.25 | 1.18 | 1.2$_3$ |
| 0.4 | | 1.59 | 1.64 | 1.6$_4$ | 1.58 | 1.62 | 1.51 | 1.6$_0$ |
| 0.5 | 1.28 | 1.96 | 2.00 | 2.0$_3$ | 1.97 | 1.99 | 1.84 | 1.9$_9$ |
| 0.6 | 1.56 | 2.33 | 2.38 | 2.4$_2$ | 2.36 | 2.37 | 2.16 | 2.4$_0$ |
| 0.7 | 1.84 | 2.71 | 2.77 | 2.8$_2$ | 2.76 | 2.75 | 2.49* | 2.8$_1$ |
| 0.8 | 2.14 | 3.10 | 3.15 | 3.2$_2$ | 3.16 | 3.15 | | |
| 0.9 | 2.45 | 3.50 | $NH_4I$ | | 3.58 | 3.55 | | |
| 1.0 | 2.77 | | | | 3.95 | | | |
| 1.2 | 3.45 | | | | 4.50 | | | |
| 0.65 | | | 2.64 | | | | | |

* For [KBr] = 0.71 (satd.), [$I_2$] = 2.52.

Solubility of $I_2$ in halides dissolved in organic nitro-compounds; $t$ = 16–17°; [X] in M/l$_s$; accuracy ±0.5–2% ([7, 8, 9]).—(*Cont'd*)

Nitrobenzene

| Hal. = | RbI | $C_6H_5NH_3I$ | $C_6H_5N(CH_3)_2HI$ | $NH_4I$ | $BaI_2$ | $(CH_3)_4NI$ | $SrI_2$ |
|---|---|---|---|---|---|---|---|
| [Hal.] | [$I_2$] | [$I_2$] | [$I_2$] | [$I_2$] | [$I_2$] | [$I_2$] | [$I_2$] |
| 0.1 | 0.55 | 0.51 | 0.52 | 0.51 | 0.85 | 0.53 | 0.82 |
| 0.2 | 0.91 | 0.85 | 0.85 | 0.86 | 1.55 | 0.89 | 1.52 |
| 0.3 | 1.28 | 1.20 | 1.20 | 1.21 | 2.30 | 1.24 | 2.28 |
| 0.4 | 1.65 | 1.55 | 1.56 | 1.59 | 3.14 | | |
| 0.5 | 2.03 | 1.91 | 1.93 | 1.98 | | | |
| 0.6 | 2.41 | 2.29 | 2.31 | | | | |
| 0.7 | 2.82 | 2.68 | 2.69 | | | | |
| 0.8 | 3.22 | 3.07 | | | | | |
| 0.9 | 3.64 | | | | | | |
| 1.0 | 4.08 | | | | | | |

Iodides of alkali metals and ammonium in equilibrium with iodine dissolved in benzene; [$I_2$] in M/l$_s$; 25°; accuracy *ca.* ±1% ([1])

| Solid phases | [$I_2$] | Solid phases | [$I_2$] |
|---|---|---|---|
| $I_2$ | 0.548 | $RbI_3 + RbI_7(?)$ | 0.348 |
| $LiI + I_2$ | 0.548 | $RbI_7 + RbI_9(?)$ | 0.401 |
| $NaI + I_2$ | 0.548 | $CsI + CsI_3$ | 0.00169 |
| $KI + KI_7(?)$ | 0.333 | $(CsI_3 + CsI_5$ or $CsI_7)(?)$ | 0.0850 |
| $NH_4I + NH_4I_3(?)$ | 0.0285 | $CsI_3 + CsI_9(?)$ | 0.282 |
| $RbI + RbI_3(?)$ | 0.0133 | | |

Relative freezing-point lowering ($R$) of $I_2$ and iodides in nitrobenzene; iodide = 0.1M/l$_s$; "Comp." = "empirical composition of total solute" ([10])

| Iodide | $I_2$, M/l$_s$ | "Comp." | $R$ |
|---|---|---|---|
| NiI | 0.1 | $I_2$ | **1.00** |
| KI | 0.1 | $KI_3$ | 1.83 |
| KI | 0.2 | $KI_5$ | 1.90 |
| KI | 0.3 | $KI_7$ | 2.25 |
| KI | 0.4 | $KI_9$ | 2.72 |
| $NH_4I$ | 0.2 | $NH_4I_5$ | 1.83 |
| $(CH_3)_4NI$ | 0.2 | $(CH_3)_4NI_5$ | 1.89 |
| $(C_3H_7)_4NI$ | 0 | $(C_3H_7)_4NI$ | 1.35 |
| $(C_3H_7)_4NI$ | 0.1 | $(C_3H_7)_4NI_3$ | 1.68 |
| $(C_3H_7)_4NI$ | 0.2 | $(C_3H_7)_4NI_5$ | 1.78 |

$I_2 + S + CS_2$; accuracy *ca.* ± 1%; densities also given ([26])

| 10°C | | | | 18°C | | | |
|---|---|---|---|---|---|---|---|
| % S | % $I_2$ | % S | % $I_2$ | % S | % $I_2$ | % S | % $I_2$ |
| Solid: $I_2$* | | Solid: S | | Solid: $I_2$* | | Solid: S | |
| 0 | 10.74 | 23.55 | 0 | 0 | 13.54 | 28.70 | 0 |
| 5 | 11.33 | 24.13 | 2 | 5 | 14.18 | 29.40 | 2 |
| 10 | 11.92 | 24.57 | 4 | 10 | 14.83 | 30.02 | 4 |
| 15 | 12.50 | 25.23 | 6 | 15 | 15.47 | 30.69 | 6 |
| 20 | 13.09 | 25.84 | 8 | 20 | 16.11 | 31.34 | 8 |
| 25 | 13.66 | 26.30 | 10 | 25 | 16.76 | 31.97 | 10 |
| Solids: $I_2 + S$ | | 26.81 | 12 | 30 | 17.40 | 32.54 | 12 |
| 27.33 | 13.93 | | | Solids: $I_2 + S$ | | 33.10 | 14 |
| | | | | 34.16 | 17.93 | 33.60 | 16 |

* At 10°, % $I_2$ = 10.74 + 0.1175 (% S). At 18°, % $I_2$ = 13.54 + 0.1286 (% S), (±0.3 to 1 %).

S + Se + Te ([23]); *see* Fig. 2; two solid solutions; $\alpha$, monoclinic; $\beta$, monoclinic?

| $t$, °C | Mole %, liq. | | | Mole %, $\alpha$ | | | Mole %, $\beta$ | | |
|---|---|---|---|---|---|---|---|---|---|
| | S | Se | Te | S | Se | Te | S | Se | Te |
| 104 | 60 | 40 | 0 | 73 | 27 | 0 | 50 | 50 | 0 |
| 106 | 98.4 | 0 | 1.6 | 99.5 | 0 | 0.5 | 9 | 0 | 91 |

S + Se + $CS_2$ ([33]); *see* Fig. 3; accuracy very uncertain; equilibrium apparently not completely established in all experiments.

Te + $Ag_2Te$ + $AuTe_2$([32]); *see* Fig. 4

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## FREEZING-POINT—SOLUBILITY DATA FOR THREE- (OR MORE) COMPONENT AQUEOUS SOLUTIONS OF SALTS AND INORGANIC COMPOUNDS

W. C. Blasdale

### Scope of the Section

This section includes all systems composed of water and two or more components belonging to one or more of the following classes: (*a*) salts; (*b*) strong acids or bases; (*c*) compounds whose key-formulae do not begin with 16, except:

1. Some data involving slightly soluble substances, for which *see* final index.
2. Detailed values along the ice curve, for which *see* p. 254.
3. Data involving two liquid phases, for which *see* Vol. III, p. 386.
4. Systems containing two soaps, *see* final index.

The pressure is atmospheric unless otherwise noted.

### Arrangement

The systems are listed in the standard arrangement (*v.* Vol. III, p. viii) in accordance with the principal ions which are present in solution. To find a given system, proceed as follows: Write down

### Champ de la Section

Cette section comprend tous les systèmes composés d'eau et de deux constituants ou plus appartenant à l'une ou à plusieurs des classes suivantes: (*a*) sels; (*b*) acides ou bases forts; (*c*) composés dont la formule clé ne commence pas par 16, à l'exception:

1. De quelques données se rapportant à des substances peu solubles; pour celles-ci, *voir* l'index final.
2. Des valeurs détaillées, le long de la courbe de congélation; pour celles-ci, *voir* p. 254.
3. Des données se rapportant à deux phases liquides; pour celles-ci, *voir* Vol. III, p. 386.
4. Des systèmes contenant deux savons; pour ceux-ci, *voir* l'index final.

La pression est la pression atmosphérique à moins d'une autre indication.

the principal ions present (omitting $H^+$ and $OH^-$) and arrange them in the standard arrangement. Thus the finding formula for the system, $H_2O + Al_2(SO_4)_3 + KOH$ or the system $H_2O$ + [$Al(OH)_3$ or $Al_2O_3$] + $K_2SO_4$, would be $SO_4^{--}$, $Al^{+++}$, $K^+$. Using the standard arrangement first locate $SO_4^{--}$. Under that find $Al^{+++}$, and under $Al^{+++}$ find $K^+$.

In the case of amphoteric electrolytes or in other cases where the principal ion species is not obvious, any of the ion species or the full formula of the substance itself may be used in the finding formula for the system and the system will be located with little difficulty.

**Abbreviations, Symbols and Conventions;** *v.* p. 4

The compositions given in the tables are those of the liquid phase (except where otherwise indicated) when it is in equilibrium with the solid phases which are indicated in the center of the columns.

**Diagrams** (*v.* p. 382–394) (412)

*General.*—In all diagrams the compositions of the liquid phase, or of mixtures of liquid and solid phases, are represented by crosses. The theoretical compositions of pure solids are represented by small circles labeled with the formula of the solid. The letters A, B, C, D, etc., which appear on the diagrams are used also in the corresponding tables where quantitative data for the points thus designated are given.

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**Umfang**

Dieser Abschnitt enthält alle aus Wasser bestehende Systeme mit noch zwei oder mehr Komponenten, welche zu einer der folgenden Klassen (oder zu deren mehreren) gehören: (*a*) Salze, (*b*) starke Säuren oder Basen, (*c*) Verbindungen deren Schlüssetzahl nicht mit 16 beginnt, ausgenommen:

1. Werte die sehr wenig lösliche Stoffe betreffen, *siehe* Schlüssindex.
2. Genauere Werte längst der Eiskurve, *siehe* S. 254.
3. Werte für zwei flüssige Phasen, *siehe* Bd. III, S. 386.
4. Systeme welche zwei Seifen enthalten, *siehe* Schlussindex.

Druck immer atmosphärischer, wenn nichts anderes angegeben.

**Anordnung**

Die Systeme sind in der Standardanordnung (Bd. III, S. viii), in Übereinstimmung mit den in der Lösung vorwaltend vorhandenen Jonen, gereiht. Um ein gegebenes System zu finden, gehe man folgendermassen vor: Man schreibe die vorhandenen vorwaltenden Jonen (mit Ausnahme von $H^+$ und $OH^-$) nieder und ordne sie nach der Standardanordnung. Für das System, z. B., $H_2O + Al_2(SO_4)_3 + KOH$ oder $H_2O$ + [$Al(OH)_3$ oder $Al_2O_3$] + $K_2SO_4$, wäre die so niedergeschriebene Formel: $SO_4^{--}$, $Al^{+++}$, $K^+$ auf Grund welcher nun das Nachschlagen zu erfolgen hat. Nach der Standardanordnung hat man zuerst $SO_4^{--}$ festzustellen, unter diesem $Al^{+++}$, und unter $Al^{+++}$, $K^+$.

Im Falle amphoterer Elektrolyte, oder in Fällen wo es nicht klar ist welches Jon als vorwaltend anzusehen ist, benütze man irgend eine Jonenart oder die ganze Formel des Stoffes selbst zum Nachschlagen. Das System kann auch so ohne viel mehr Schwierigkeit festgestellt werden.

**Abkürzungen, Zeichen unú Festlegungen;** *siehe* dafür S. 4

Die in den Tafeln angegebenen Zusammensetzungen betreffen die flüssigen Phasen (ausgenommen dorten wo es anders angegeben ist) im Gleichgewicht mit der in der Mitte der Spalte verzeichneten festen Phase.

**Diagramme** (S. 382–394) (412)

In allen Diagrammen ist die Zusammensetzung der flüssigen Phase oder der Mischung von flüssigen und festen Phasen durch Kreuze dargestellt. Die theoretische Zusammensetzung der reinen festen Stoffe ist durch kleine Kreise kenntlich gemacht, bei

**Arrangement**

Les systèmes sont disposés en liste suivant l'arrangement type (*v.* Vol. III, p. viii) en accord avec les principaux ions présents dans la solution. Pour trouver un système donné, il faut procéder comme suit: Écrire les principaux ions présents (en omettant $H^+$ et $OH^-$) et les disposer suivant l'arrangement type. Ainsi la formule de recherche pour le système, $H_2O + Al_2(SO_4)_3 + KOH$ ou du système $H_2O$ + [$Al(OH)_3$ ou $Al_2O_3$] + $K_2SO_4$, sera $SO_4^{--}$, $Al^{+++}$, $K^+$. Utilisant l'arrangement type d'abord trouver $SO_4^{--}$. Sous ce dernier on trouvera $Al^{+++}$, et sous $Al^{+++}$ on cherchera $K^+$.

Dans le cas d'électrolytes amphotères ou dans d'autres cas où l'espèce de l'ion principal n'est pas évidente, on peut utiliser pour la formule de recherche du système l'une des espèces de l'ion ou même la formule complète de la substance et le système sera trouvé avec peu de difficulté.

**Abréviations, Symboles et Conventions;** *voir* p. 4

Les compositions données dans les tables sont celles de la phase liquide (à moins d'une autre indication) lorsqu'elle se trouve en équilibre avec les phases solides qui sont indiquées dans le centre des colonnes.

**Diagrammes** (*v.* p. 382–394) (412)

Dans tous les diagrammes, les compositions de la phase liquide ou des mélanges des phases liquides et solides sont représentées par des croix. Les compositions théoriques des solides purs sont représentées par de petits cercles comprenant la formule du solide. Les lettres A, B, C, D, etc., inscrites sur les diagrammes se retrouvent dans les tables correspondantes où se trouvent les données quantitative pour les points ainsi désignés.

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**Sommario**

Questo capitolo comprende tutti i sistemi formati da acqua e da due o più componenti appartenenti a una o più delle seguenti classi: (*a*) sali; (*b*) acidi e basi forti; (*c*) composti la cui formula chiave non comincia con 16. Sono eccettuati:

1. Alcuni dati intorno a sostanze poco solubili, per i quali si deve consultare l'indice finale.
2. Valori dettagliati riferentisi alla curva di ghiaccio, per i quali si deve consultare p. 254.
3. Dati riferentisi a due fasi liquide, per i quali si veda a Vol. III, p. 386.
4. Sistemi contenenti due saponi, *vedi* l'indice finale.

La pressione è sempre quella atmosferica quando non siano date altre indicazioni.

**Ordine di Disposizione**

Seguendo l'ordine di disposizione standard (*v.* Vol. III, p. viii) i sistemi sono elencati basandosi sopra i principali ioni presenti in soluzione. Per trovare un dato sistema si scrivono i principali ioni presenti (omettendo $H^+$ e $OH^-$) e si dispongono nell'ordine standard. Così, ad esempio, la formula per il sistema: $H_2O + Al_2(SO_4)_3 + KOH$ oppure per il sistema $H_2O$ + [$Al(OH)_3$ o $Al_2O_3$] + $K_2SO_4$, sarà $SO_4^{--}$, $Al^{+++}$, $K^+$. Secondo l'ordine standard si mette al primo posto $SO_4^{--}$, viene poi $Al^{+++}$, e infine $K^+$.

Nel caso di elettroliti amfoteri, e altri casi in cui non è evidente quali sono i tipi principali di ioni, si può usare per formula di ricerca una qualunque delle specie di ioni oppure l'intiera formula della sostanza; il sistema sarà in ogni caso rintracciabile senza grave difficoltà.

**Abbreviazioni, Simboli e Convenzioni;** *vedi* p. 4

Le composizioni riportate nelle tabelle sono quelle della fase liquida (salvo contrarie indicazioni) in equilibrio con i solidi indicati nel centro delle colonne.

**Diagrammi** (*v.* p. 382–394) (412)

In tutti i diagrammi le composizioni delle fasi liquide o dei miscugli di liquidi e solidi sono indicate con croci. Le composi-

welchen die Formel des festen Stoffes steht. Die Buchstaben A, B, C, D, etc., welche in den Diagrammen vorkommen, werden ebenfalls in den entsprechenden Tabellen gebraucht, in welchen sich die quantitativen Angaben für die Lage der so bezeichneten Punkte vorfinden.

zioni teoriche dei solidi puri sono rappresentate da piccoli circoli, nei quali è scritta la formula del solido. Le lettere A, B, C, D, ecc, che compaiono nei diagrammi sono usate anche nelle tavole corrispondenti dove si trovano riportati dati quantitativi per i punti segnati a questo modo.

### Three-Component Systems

In these systems the equilateral triangle has been largely employed. The three apices of the triangle represent 100% and the three opposite edges 0% of each of the three respective components, namely, water and two electrolytes. The broken line connecting the points representing the composition of the two solutions saturated as to the two electrolytes, separates the region representing unsaturated solutions from that representing different proportions of saturated solution and one or more solid phases. Thus the broken line AB-BC-CD-DE-EF of Fig. 43 represents the composition of the solutions in equilibrium with each of the five different solid phases concerned.

Where the nature of the solid phase has been determined by the residue method of Schreinemakers many of the data representing the composition of mixtures of saturated solutions and solids have been given on the diagram, only rarely in numerical form. This method consists in determining the composition of a series of liquid phases, and of mixtures of these liquids and the solid or solids with which they are in equilibrium. When the points representing such a solution and the corresponding mixture are connected, the line must converge toward a point representing the composition of the solid, if the solution is saturated with that solid. Thus the convergence of the lines extending from points on the CD portion of the curve (Fig. 43) indicates that all of these solutions are saturated with a solid having the composition $NH_4Cl.FeCl_3$. The lack of convergence, at least within the limits of the diagram, of the lines extending from points on the AB portion of the curve indicates that the solid here concerned is of variable composition and is made up of mixtures of $NH_4Cl$ and $FeCl_3.2H_2O$.

Certain systems yield more intelligible diagrams when represented by reference to two axes intersecting at 90°, each axis representing the amount of electrolyte, either in grams, equivalents or moles, per constant amount of water or saturated solution. Thus in Fig. 83 the horizontal axis represents the $SO_3$ and the vertical the $NH_4OH$ in moles per 1000 g of solution. The broken line AB-BCD-DE-EFG represents the composition of solutions in equilibrium with each of the four different solid phases.

A third type of diagram has been used in dealing with systems in which the two electrolytes form one or more series of solid solutions, as in Fig. 48. The percentage by weight of one electrolyte (in the illustration cited, $NH_4Cl$) in the solid phase is plotted on a horizontal axis, and the percentage of the same electrolyte in the mixture of the solid salts present in the saturated solution (in the illustration, of $NH_4Cl$ and KCl) with which this solid is in equilibrium, on the vertical axis. If the resulting curve is continuous, as in the curve for 90°C, it signifies that the two solids form a continuous series of solid solutions. If it shows discontinuities associated with horizontal portions, as the curve for 25°C, it signifies that at least two different solid solutions are concerned. At this temperature one of the two solids can vary from 0 to 21%, corresponding to the point D, of $NH_4Cl$ and the other from 93%, corresponding to the point E, to 100% of $NH_4Cl$.

Where sufficient data were available, a temperature-concentration diagram has been used. The composition of the liquid phase at various temperatures is plotted with respect to three axes. The horizontal and vertical axes represent the respective percentages of the two electrolytes in the solution and the third, which is made to assume an angle of 45° with the two others, represents temperature. When the points representing saturation with respect to two different solids are properly connected a series of polythermal lines results which indicate the limits in space of the surfaces representing solutions saturated with respect to the different solids. Thus in Fig. 99 the horizontal axis indicates percentages of $(NH_4)_2SO_4$, the vertical one of $Na_2SO_4$ and the five surfaces represent solutions of varying composition saturated as to ice, $Na_2SO_4.10H_2O$, $(NH_4)_2SO_4.Na_2SO_4.4H_2O$, $(NH_4)_2SO_4$ and $Na_2SO_4$. The space included within these surfaces and the vertical and horizontal planes represents unsaturated solutions.

### Four-Component Systems

Four-component systems composed of water and three electrolytes which yield a common ion have been represented by reference to three axes which intersect in space at 90° but are shown on a plane surface as though they intersected at 120°. Each axis represents the amount of one of the three electrolytes present in a constant amount of water or of saturated solution. Thus in Fig. 129 the point D on the vertical axis represents the number of equivalents of $MgSO_4$ per 1000 M of water required to saturate the solution with $MgSO_4.7H_2O$. Similarly the point G represents the equivalents of $K_2SO_4$ required to saturate the solution with $K_2SO_4$ and A the equivalents of $Na_2SO_4$ required to saturate with $Na_2SO_4$. It is obvious that the line D-E-F-G represents the three-component system $MgSO_4 + K_2SO_4 + H_2O$; the line G-H-I-A, the system $K_2SO_4 + Na_2SO_4 + H_2O$ and the line A-B-C-D, the system $Na_2SO_4 + MgSO_4 + H_2O$. The four-component system is limited by the three planes between the three axes, and by a series of surfaces in the space between these planes. In this illustration this surface is composed of six separate surfaces, which are assumed to be planes, intersecting in the points P, Q, R, and S. Each of these surfaces represents the series of solutions of varying composition saturated with respect to some one solid phase, the composition of which is indicated by the labels.

In some systems the composition of the liquid phase is expressed in terms of the number of grams or moles of the three electrolytes in 100 g or M of the mixture of salts, which would be obtained if the liquid phase were evaporated to dryness, and the resulting salts dehydrated. Where this method is employed it is also necessary to state the amount of water needed to dissolve 100 g or M of the mixed salts to define the composition of the liquid phase completely. The proportions of the three salts in the residue which would be obtained by evaporating the liquid phase are conveniently represented by means of the equilateral triangle as in Fig. 59.

Four-component systems composed of water and four different ions, which form a reciprocal salt pair, necessarily include four three-component systems as constituent parts, each of which is treated separately. The liquid phase of the more complex system is conveniently represented graphically by the method of van't Hoff. This necessitates expressing its composition in equivalents (not in weight units) per constant amount of water or of solution. If all four ions are in the solution three different salts are needed to express the composition of any such solution, and four are necessary for all possible solutions, unless negative quantities are employed. The amounts of these four salts are measured from the point of intersection of two axes which make an angle of 90° with each other. Thus in Fig. 85 the point A represents solutions saturated with $Na_2SO_4.10H_2O$, E with $(NH_4)_2SO_4$, G with $(NH_4)HCO_3$ and I with $NaHCO_3$. If the solution contains both $Na_2SO_4$ and $(NH_4)HCO_3$ or both $(NH_4)_2SO_4$ and $NaHCO_3$ the excess of one salt over the other is measured on the axis to which the excess pertains. The point of intersection may represent either pure

water or solutions which contain any one of an infinite number of equivalent proportions of the two pairs of salts. Solutions containing any one of the four ions as a common ion must be represented by a series of points, which form four different broken lines connecting the points representing saturation as to a single salt. The space included within these lines must represent solutions containing all four ions and saturated with respect to one, two or three different solids. If the points representing saturation as to different pairs of solids are connected the entire space is divided into areas, each area indicating all possible solutions saturated as to each of the solids represented. Thus in Fig. 85 the lines JP, BP, PQ, CQ, QR, RH, RS, SF and SD represent saturation with respect to the two solids whose formulae are printed within the areas which the lines separate. The points P, Q, R and S represent saturation with respect to three different solids.

### Five-Component Systems

It is not possible to represent these systems by a graphical method unless certain simplifications are made. In the only system of this degree of complexity for which data are available, namely, the system composed of $MgCl_2 + KCl + NaCl + Na_2SO_4 + H_2O$, it is assumed that the solution is always saturated with NaCl. It then becomes possible to express the composition of the liquid phase by means of three axes representing KCl, $MgCl_2$, and $Na_2SO_4$, respectively. In order to express the composition in conformity with this scheme it is necessary to assume that $Na_2SO_4 = MgSO_4 + 2NaCl - MgCl_2$, or expressed differently, that all the $SO_4$ is measured on the $Na_2SO_4$ axis and all the Mg on the $MgCl_2$ axis. The three axes may be made to intersect at 120° and the composition of the solution expressed in terms of K, ½ Mg, and ½$SO_4$ as has been done in Figs. 18 to 21, inclusive.

### Six-Component Systems

The only one for which data are available is derived from $CaCl_2$, $MgCl_2$, KCl, $Na_2SO_4$ and $H_2O$; it results from adding Ca to the five-component system just considered. It is again necessary to assume that NaCl is always present as a solid and to eliminate solutions in equilibrium with chloride-containing calcium salts. Owing to the slight solubility of both single and double sulfates of calcium their presence as solid phases changes but slightly the form and dimensions of Figs. 18 and 19. A fair understanding of the system at 0°C and 25°C is obtained by assuming that the spaces limited by the planes of these figures are subdivided into smaller spaces which correspond to spaces saturated as to some one solid which contains Ca and $SO_4$. At 0°C the plane A-B-E-D of Fig. 9 separates spaces representing saturation as to $CaSO_4.2H_2O$ and $CaSO_4.K_2SO_4.H_2O$. At 25°C (Fig. 10) there are six planes which separate spaces representing saturation as to $CaSO_4$, $CaSO_4.K_2SO_4.H_2O$, $CaSO_4.Na_2SO_4$ and $MgSO_4.K_2SO_4.2CaSO_4.2H_2O$, respectively.

At 55°C (Fig. 11) addition of the calcium ion changes the form of the entire diagram, since $CaSO_4$ reacts with KCl and it becomes necessary to consider $CaCl_2$ as an important constituent of the liquid phase. The calcium content can be measured on the $SO_4$ axis but in the opposite direction from that used to represent $SO_4$. Owing to the limited data it is only possible to outline roughly the limits of the spaces representing solutions containing but little magnesium, which are saturated as to $CaSO_4$, $CaSO_4.Na_2SO_4$, $CaSO_4.K_2SO_4.H_2O$ and $5CaSO_4.K_2SO_4.H_2O$. Above these spaces there is one saturated as to $MgSO_4.K_2SO_4.H_2O$ and probably others saturated as to still other complex calcium-containing sulfates.

At 83°C (Fig. 12) the formation of $CaCl_2$ is still further accentuated and although the solid calcium-containing phases are not changed, the spaces within the diagram to which they correspond are changed profoundly.

**$H_2O_2$ $SO_4^{--}$ $K^+$**
$H_2O + H_2O_2 + K_2SO_4$
$t$ = 20°C (227)

| g $H_2O_2$/l | g $K_2SO_4$/l |
|---|---|
| $K_2SO_4$ | |
| 43.8 | 136.1 |
| 44.0 | 139.9 |
| 85.6 | 167.2 |
| 130.7 | 199.6 |
| 162.8 | 224.8 |
| 168.0 | 232.3 |
| 232.1 | 265.8 |
| 247.5 | 288.3 |
| 302.7 | 341.4 |
| 305.4 | 346.8 |
| 726.0 | 672.2 |

**$F^-$ $Cl^-$ $Sb^{+++}$ $K^+$**
$H_2O + SbF_3 + KCl$
$t$ = 0°C (316)

| $M_{KCl}$/l | g $SbF_3$/100g $H_2O$ |
|---|---|
| $SbF_3$ | |
| 0 | 384.7 |
| 0.125 | 407.3 |
| 0.250 | 431.9 |
| 0.500 | 448.3 |
| 1.000 | 461.8 |

**$F^-$ $Br^-$ $Sb^{+++}$ $K^+$**
$H_2O + SbF_3 + KBr$
$t$ = 0°C (316)

| $M_{KBr}$/l | g $SbF_3$/100g $H_2O$ |
|---|---|
| $SbF_3$ | |
| 0 | 384.7 |
| 0.125 | 417.2 |
| 0.250 | 455.6 |
| 0.500 | 450.0 |
| 1.000 | 448.7 |

**$F^-$ $NO_3^-$ $Sb^{+++}$ $K^+$**
$H_2O + SbF_3 + KNO_3$
$t$ = 0°C (316)

| $M_{KNO_3}$/l | g $SbF_3$/100g $H_2O$ |
|---|---|
| $SbF_3$ | |
| 0 | 384.7 |
| 0.125 | 401.4 |
| 0.250 | 418.3 |
| 0.500 | 451.9 |
| 1.000 | 458.2 |

**$F^-$ $NH_4^+$ $Sb^{+++}$ $C_2O_4^{--}$**
$H_2O + NH_4F + Sb_2(C_2O_4)_3$
$t$ = 0°C (316)

| M ½$(NH_4)_2$-$C_2O_4$/l | g $SbF_3$/100g $H_2O$ |
|---|---|
| $SbF_3$ | |
| 0 | 384.7 |
| 0.125 | 433.3 |
| 0.250 | 442.3 |
| 0.500 | 431.9 |

**$F^-$ $Sb^{+++}$**
$H_2O + HF + SbF_3$
$t$ = 0°C (316)

| $M_{HF}$/l | g $SbF_3$/100g $H_2O$ |
|---|---|
| $SbF_3$ | |
| 0 | 384.7 |
| 0.5 | 404.0 |
| 1.0 | 432.5 |
| 2.0 | 474.9 |

**$F^-$ $Sb^{+++}$ $C_2O_4^{--}$ $K^+$**
$H_2O + SbF_3 + K_2C_2O_4$
$t$ = 0°C (316)

| M ½$K_2C_2O_4$/l | g $SbF_3$/100g $H_2O$ |
|---|---|
| $SbF_3$ | |
| 0 | 384.7 |
| 0.125 | 405.2 |
| 0.250 | 451.3 |
| 0.500 | 481.2 |
| 1.000 | 465.7 |

**$F^-$ $Sb^{+++}$ $C_4H_4O_6^{--}$ $K^+$**
$H_2O + SbF_3 + K_2C_4H_4O_6$
$t$ = 0°C (316)

| M ½$K_2C_4H_4O_6$/l | g $SbF_3$/100g $H_2O$ |
|---|---|
| $SbF_3$ | |
| 0 | 384.7 |
| 0.125 | 435.2 |
| 0.250 | 430.8 |
| 0.500 | 430.5 |
| 1.000 | 461.4 |

**$F^-$ $Hg^{++}$**
$H_2O + HF + HgO$
$t$ = 25°C (89)

| $M_F$/l | $M_{Hg}$/l |
|---|---|
| $HgF_2$ | |
| 9.60 | 0.736 |
| 8.60 | 0.6825 |
| 7.63 | 0.6265 |
| 5.00 | 0.440 |
| 2.05 | 0.2022 |
| 1.309 | 0.1385 |
| $HgF_2 + HgO$ | |
| 1.148 | 0.1227 |

**$F^-$ $Pb^{++}$ $Na^+$**
$H_2O + HF + PbF_2 + NaF$
$t$ = 25°C (74)

| % $H_2F_2$ | % $Na_2F_2$ | % $PbF_4$.-2NaF |
|---|---|---|
| $PbF_4.2NaF$ | | |
| 38.61 | 0.368 | 9.358 |
| 40.0 | Tr. | 10.49 |
| 37.23 | 2.33 | 5.07 |

**$F^-$ $Pb^{++}$ $K^+$**
$H_2O + HF + PbF_2 + KF$
$t$ = 25°C (74)

| % $H_2F_2$ | % $K_2F_2$ | % 3KF.-HF.$PbF_4$ |
|---|---|---|
| 3KF.HF.$PbF_4$ | | |
| 29.1 | 1.71 | 11.23 |
| 30.0 | 0.0 | 12.21 |
| 20.0 | 25.0 | 1.70 |

$F^- Ag^+$ (156): $H_2O + HF + AgF$

| $t$ = 0°C | | $t$ = 14°C | | $t$ = 24°C | | $t$ = 32°C | |
|---|---|---|---|---|---|---|---|
| % HF | % AgF | % HF | % AgF | % HF | % AgF | % HF | % AgF |
| | | | $AgF.4H_2O$ | | | | |
| 0.40 | 87.50 | 0.40 | 137.0 | | | | |
| 3.97 | 93.80 | 2.60 | 145.0 | | | | |
| 9.60 | 118.50 | 5.80 | 159.25 | | | | |
| 13.75 | 153.0 | | | | | | |
| | | | $AgF.4H_2O + AgF.2H_2O$ | | | | |
| 14.0 | 156.0 | 6.40 | 162.0 | | | | |
| | | | $AgF.2H_2O$ | | | | |
| 17.2 | 159.0 | 14.50 | 169.5 | 0.0 | 178.00 | 0.0 | 193.0 |
| 24.0 | 185.0 | 17.30 | 176.0 | 8.1 | 178.0 | | |
| 24.40 | 186.8 | 18.50 | 180.50 | 10.0 | 179.50 | | |
| | | 19.35 | 187.0 | 13.4 | 189.50 | | |
| | | | $AgF.2H_2O + AgF$(?) | | | | |
| | | | | 14.30 | 191.50 | | |
| | | | $AgF.H_2O$ | | | | |
| | | | | 13.0 | 194.50 | 0.45 | 216.75 |
| | | | $AgF.H_2O + AgF$ | | | | |
| | | | | 18.80 | 189.50 | 4.70 | 211.75 |
| | | | AgF | | | | |
| 25.70 | 189.0 | 25.40 | 189.0 | 36.6 | 193.0 | 7.0 | 205.00 |
| 28.0 | 189.0 | 27.00 | 186.0 | 16.0 | 193.50 | 11.0 | 198.0 |
| 29.50 | 188.0 | 28.80 | 188.20 | | | 29.0 | 179.0 |
| 38.00 | 194.0 | 38.00 | 196.50 | | | 16.40 | 185.5 |
| 39.2 | 195.8 | 40.00 | 197.50 | | | 36.60 | 194.50 |
| | | | $AgF + AgF.2HF$ | | | | |
| | | 42.50 | 201.00 | | | | |
| | | 56.40 | 134.50 | | | | |
| | | | $AgF.2HF$ | | | | |
| 54.80 | 130.3 | | | | | | |
| 56.70 | 127.6 | | | | | | |
| 57.20 | 127.75 | | | | | | |
| 66.57 | 94.93 | | | | | | |
| | | | $AgF.2H_2O$ | | | | |
| | | 4.47 | 162.0 | | | | |
| | | 5.68 | 162.0 | | | | |
| | | | $3AgF.5H_2O$* | | | | |
| 0.40 | 173.75 | 0.40 | 190.00 | 1.25 | 206.20 | | |
| 3.60 | 174.00 | 8.10 | 189.00 | 7.90 | 202.50 | | |
| | | 13.25 | 188.00 | 12.65 | 198.60 | | |
| | | 14.80 | 189.80 | | | | |

* Metastable at all temperatures studied. A number of determinations are given in (156) for other temperatures which are not easily classified. The solid $AgF.H_2O$ was obtained in a number of instances but always as a metastable form.

Transition temperatures

| Solid phases | °C | g $AgF/100g\ H_2O$ |
|---|---|---|
| $AgF.4H_2O$ + Ice | −14.2 | 60 |
| $AgF.4H_2O + AgF.2H_2O$ | +18.65 | 169.5 |
| $AgF.2H_2O + AgF$ | 39.50 | 222 |
| $AgF.H_2O + AgF$ | 38.20 | 223 |
| $3AgF.5H_2O + AgF.H_2O$ | 27 | 224 *ca.* |

$F^- Cb^{+++++} K^+$ (318)

$H_2O + HF + CbF_5 + KF$

| °C | Solid phases | Liquid phase % $CbF_5$ | % HF | % KF |
|---|---|---|---|---|
| 16 | $K_2CbOF_5.H_2O$ | 5.19 | 2.98 | 0.35 |
| | $K_2CbOF_5.H_2O + 2KF.CbF_5$ | 7.07 | 5.33 | 4.34 |
| | $2KF.CbF_5$ | 4.33 | 2.32 | 10.43 |
| | $K_2CbOF_5.H_2O$ | 1.16 | 5.54 | −0.13* |
| | $K_2CbOF_5.H_2O + 2KF.CbF_5$ | 2.67 | 6.04 | 5.39 |

$F^- Cb^{+++++} K^+$.—*(Continued)*

| °C | Solid phases | Liquid phase % $CbF_5$ | % HF | % KF |
|---|---|---|---|---|
| 85 | $K_2CbOF_5.H_2O + (?)$ | 30.39 | 11.68 | 0.35 |
| 80 | | 11.66 | 10.08 | −1.53* |

* Negative values indicate presence of oxyfluoride instead of pentafluoride as assumed in the calculations.

$F^- Ta^{+++++} K^+$ (318)

$H_2O + HF + TaF_5 + KF$

| °C | Solid phases | Liquid phase % $TaF_5$ | % KF | % HF |
|---|---|---|---|---|
| 18 | $K_xTa_yO_zF + 2KF.TaF_5$ | 0.25 | 0.12 | 0.029 |
| | $K_xTa_yO_zF + 2KF + TaF_5$ | 0.10 | 4.79 | 0.074 |
| | | 0.09 | 6.73 | 0.015 |
| 16 | $2KF.TaF_5$ | 1.33 | 0.56 | 4.47 |
| 18 | | 1.24 | 0.52 | 4.20 |
| 18.5 | | 5.35 | 2.25 | 24.30 |
| 18 | | 0.036 | 21.93 | 10.44 |
| 85 | $K_xTa_yO_zF + 2KF.TaF_5$ | 2.18 | 1.69 | 0.85 |
| | | 0.96 | 5.27 | 1.17 |
| 90 | $2KF.TaF_5$ | 5.73 | 2.41 | 4.47 |
| | | 6.00 | 2.52 | 4.2 |
| | | 10.91 | 4.59 | 24.30 |
| | | 1.18 | 22.42 | 10.44 |

$F^- Na^+$

$H_2O + HF + NaF$

$t$ = 25°C (74)

| % $H_2F_2$ | % $Na_2F_2$ |
|---|---|
| | $Na_2F_2$ |
| 0.0 | 4.03 |
| 1.0 | 3.9 |
| 4.4 | 2.1 |
| | $NaHF_2$ (?) |
| 7.7 | 2.0 |
| 11.5 | 2.08 |
| 37.3 | 2.9 |
| 43.7 | 4.5 |

$t$ = 20°C (224)

g per 100g $H_2O$

| $H_2F_2$ | $Na_2F_2$ |
|---|---|
| | $Na_2F_2$ |
| 0.081 | 4.14 |
| 0.104 | 4.19 |
| 0.135 | 4.23 |
| 0.420 | 4.51 |
| | $Na_2F_2 + NaHF_2$* |
| 0.484* | 4.56* |
| | $NaHF_2$ |
| 0.660 | 3.45 |
| 0.831 | 2.99 |
| 1.20 | 2.49 |
| 1.55 | 2.20 |
| 2.22 | 2.04 |
| 2.70 | 2.01 |
| 4.17 | 1.88 |
| 8.68 | 1.83 |
| 10.28 | 1.79 |

* Mean of six determinations.

$F^- K^+$

$H_2O + HF + KF$

$t$ = 25°C (74)

| % $H_2F_2$ | % $K_2F_2$ |
|---|---|
| | $K_2F_2$ |
| 0.0 | 48.0 |
| 1.5 | 37.5 |
| 5.7 | 22.3 |
| 11.1 | 21.3 |
| | $KHF_2$ (?) |
| 13.8 | 22.3 |
| 17.2 | 24.1 |
| 22.3 | 26.7 |
| 30.0 | 30.0 |
| 50.0 | 40.5 |

$Cl^- ClO_4^- K^+$

$H_2O + KCl + KClO_4$

$t$ = 25°C (280)

| % KCl | % $KClO_4$ |
|---|---|
| | $KClO_4$ |
| 0 | 2.052 |
| 0.3663 | 1.755 |
| 0.7315 | 1.537 |

$Cl^- Br^- Pb^{++}$

$H_2O + PbCl_2 + PbBr_2$

$t$ = ? (263); *v.* Fig. 1

| % $PbBr_2$ | |
|---|---|
| Solid phase | Liquid phase |
| 2.3 | 0.9 |
| 3.1 | 0.3 |
| 4.4 | 1.4 |
| 4.6 | 1.1 |
| 4.8 | 1.9 |
| 5.1 | 1.0 |
| 5.2 | 2.0 |
| 6.9 | 3.0 |

**$Cl^-$ $Br^-$ $Pb^{++}$.—(*Continued*)**

% $PbBr_2$

| Solid phase | Liquid phase |
|---|---|
| 7.1 | 1.4 |
| 9.9 | 1.9 |
| 13.5 | 3.4 |
| 15.9 | 5.1 |
| 20.1 | 5.9 |
| 22.5 | 7.6 |
| 28.2 | 9.7 |
| 47.7 | 27.3 |
| 52.9 | 36.6 |
| 54.6 | 46.5 |
| 58.2 | 64.8 |
| 58.6 | 69.2 |
| 64.0 | 79.1 |

**$Cl^-$ $Br^-$ $Pb^{++}$ $Ca^{++}$**

$H_2O + PbCl_2 + CaBr_2$

$t$ = 25°C (181)

| M ½$CaCl_2$/l | M ½$PbBr_2$/l |
|---|---|
| | $PbBr_2$ |
| 0.00 | 0.05250 |
| 0.49 | 0.00924 |
| 0.98 | 0.01088 |
| 1.97 | 0.01386 |
| 2.95 | 0.02714 |
| 3.93 | 0.04710 |
| M ½$CaBr_2$/l | M ½$PbCl_2$/l |
| | $PbCl_2$ |
| 0.0 | 0.07790 |
| 0.47 | 0.01362 |
| 0.95 | 0.02130 |
| 1.91 | 0.07574 |
| 2.85 | 0.18836 |
| 3.81 | 0.43460 |

**$Cl^-$ $Br^-$ $Pb^{++}$ $Sr^{++}$**

$H_2O + PbBr_2 + SrCl_2$

$t$ = 25°C (181)

| M ½$SrBr_2$/l | M ½$PbCl_2$/l |
|---|---|
| | $PbCl_2$ |
| 0.00 | 0.07790 |
| 0.52 | 0.01258 |
| 1.04 | 0.02278 |
| 2.08 | 0.09750 |
| 3.12 | 0.27940 |
| 4.16 | 0.79860 |
| M ½$SrCl_2$/l | M ½$PbBr_2$/l |
| | $PbBr_2$ |
| 0.0 | 0.05250 |
| 0.660 | 0.01128 |
| 1.330 | 0.01254 |
| 2.66 | 0.03090 |
| 3.09 | 0.04000 |
| 4.18 | 0.05436 |

**$Cl^-$ $Br^-$ $Pb^{++}$ $Ba^{++}$**

$H_2O + PbCl_2 + BaBr_2$

$t$ = 25°C (181)

| M ½$BaBr_2$/l | M ½$PbCl_2$/l |
|---|---|
| | $PbCl_2$ |
| 0.00 | 0.07790 |
| 0.45 | 0.01206 |
| 0.91 | 0.02192 |
| 1.83 | 0.07716 |
| 2.70 | 0.25340 |
| 3.67 | 0.59200 |

**$Cl^-$ $Br^-$ $Pb^{++}$ $Ba^{++}$.—(*Cont'd*)**

| M ½$BaCl_2$/l | M ½$PbBr_2$/l |
|---|---|
| | $PbBr_2$ |
| 0.0 | 0.0525 |
| 0.52 | 0.01148 |
| 1.04 | 0.01530 |
| 2.08 | 0.04776 |

**$Cl^-$ $Br^-$ $Pb^{++}$ $Na^+$**

$H_2O + PbBr_2 + NaCl$

$t$ = 25°C (181)

| $M_{NaBr}$/l | M ½$PbCl_2$/l |
|---|---|
| | $PbCl_2$ |
| 0.00 | 0.0779 |
| 0.48 | 0.01394 |
| 0.97 | 0.02420 |
| 1.94 | 0.11864 |
| 2.82 | 0.28620 |
| 3.78 | 0.63710 |
| $M_{NaCl}$/l | M ½$PbBr_2$/l |
| | $PbBr_2$ |
| 0.0 | 0.05250 |
| 0.47 | 0.00912 |
| 0.95 | 0.1127 |
| 1.89 | 0.01688 |
| 2.84 | 0.02932 |
| 3.79 | 0.06106 |
| 4.74 | 0.12288 |

**$Cl^-$ $Br^-$ $Pb^{++}$ $K^+$**

$H_2O + PbBr_2 + KCl$

$t$ = 25°C (181)

| $M_{KCl}$/l | M ½$PbBr_2$/l |
|---|---|
| | $PbBr_2$ |
| 0.00 | 0.05250 |
| 0.48 | 0.01112 |
| 0.97 | 0.01164 |
| 1.94 | 0.01240 |
| 2.91 | 0.02114 |
| 3.88 | 0.03010 |
| $M_{KBr}$/l | M ½$PbCl_2$/l |
| | $PbCl_2$ |
| 0.0 | 0.07790 |
| 0.53 | 0.01578 |
| 1.07 | 0.01776 |
| 2.14 | 0.05034 |
| 3.21 | 0.13410 |
| 4.28 | 0.35480 |

**$Cl^-$ $Br^-$ $Sr^{++}$**

$H_2O + HBr + SrCl_2$

$t$ = 25°C (161)

M per 1000g $H_2O$

| HBr | 0.5$SrCl_2$ |
|---|---|
| | $SrCl_2.6H_2O$ |
| 0.0 | 7.034 |
| 0.06817 | 6.974 |
| 0.4191 | 6.696 |
| 0.9716 | 6.262 |
| 1.154 | 6.132 |

**$Cl^-$ $Br^-$ $K^+$**

$H_2O + HBr + KCl$

$t$ = 25°C (179)

| $M_H$/l | $M_{KCl}$/l |
|---|---|
| | KCl |
| 0 | 4.272 |
| 0.661 | 3.780 |
| 3.415 | 1.957 |

**$Cl^-$ $Br^-$ $K^+$**

$H_2O + KCl + KBr$

$t$ = 25°C (3) *v.* Fig. 2

| Solid phase % KCl | Liquid phase—g per 100g $H_2O$ KCl | KBr |
|---|---|---|
| | | KBr |
| 0.0 | 0.0 | 68.47 |
| | Solid soln. | |
| 3.9 | 5.43 | 62.26 |
| 8.3 | 8.46 | 58.50 |
| 13.09 | 12.48 | 52.45 |
| 23.02 | 17.17 | 45.42 |
| 44.77 | 20.18 | 40.53 |
| 50.93 | 21.23 | 38.70 |
| 74.43 | 24.21 | 31.53 |
| 80.98 | 25.88 | 26.62 |
| 92.48 | 31.02 | 12.94 |
| | KCl | |
| | 36.12 | 0.0 |

**$Cl^-$ $I^-$ $Pb^{++}$ $Na^+$**

$H_2O + PbI_2 + NaCl$

$t$ = 25°C (51.5)

| % $PbI_2$ | % NaCl |
|---|---|
| | $PbI_2$ |
| 0.758 | 0.0 |
| 0.778 | 0.29 |
| 0.859 | 0.59 |
| 0.951 | 1.16 |
| 1.100 | 2.30 |
| 1.410 | 5.86 |
| 1.640 | 11.70 |
| 1.790 | 29.80 |

**$Cl^-$ $I^-$ $Sr^{++}$**

$H_2O + HCl + SrI_2$

$t$ = 25°C (161)

M per 1000g $H_2O$

| HI | 0.5$SrCl_2$ |
|---|---|
| | $SrCl_2.6H_2O$ |
| 0.0 | 7.034 |
| 0.1641 | 6.890 |
| 0.4462 | 6.650 |
| 0.4126 | 6.672 |
| 0.7539 | 6.366 |

**$Cl^-$ $I^-$ $Sr^{++}$ $K^+$**

$H_2O + SrI_2 + KCl$

$t$ = 25°C (161)

M per 1000g $H_2O$

| KI | 0.5$SrCl_2$ |
|---|---|
| | $SrCl_2.6H_2O$ |
| 0.0 | 7.034 |
| 0.09199 | 7.034 |
| 0.5401 | 7.016 |
| 0.6015 | 7.038 |
| 1.445 | 6.992 |

**$Cl^-$ $I^-$ $K^+$**

$H_2O + KCl + KI$

$t$ = 25°C (3) *v.* Fig. 3

| g KCl/100g $H_2O$ | g KI/100g $H_2O$ |
|---|---|
| | KI |
| 0.0 | 149.26 |

**$Cl^-$ $I^-$ $K^+$.—(*Cont'd*)**

| g KCl/100g $H_2O$ | g KI/100g $H_2O$ |
|---|---|
| | Solid soln. I* |
| 4.06 | 144.03 |
| 4.51 | 142.01 |
| 7.63 | 137.79 |
| Solid soln. I* + Solid soln. II† | |
| 11.57‡ | 133.17‡ |
| | Solid soln. II† |
| 15.10 | 105.91 |
| 23.75 | 43.89 |
| 31.38 | 14.83 |
| 33.65 | 7.11 |
| | KCl |
| 36.12 | 0.0 |

* Solid soln. I contains from 0 to 2.23 % KCl.

† Solid soln. II from 98.37 to 100 % KCl.

‡ Average of three results.

**$Cl^-$ $SO_4^{--}$ $NH_4^+$**, *v.* p. 276

**$Cl^-$ $SO_4^{--}$ $NH_4^+$ $Cu^{++}$**, *v.* p. 276

**$Cl^-$ $SO_4^{--}$ $NH_4^+$ $Ca^{++}$**

$H_2O + NH_4Cl + CaSO_4$

$t$ = 25°C (62)

| g $NH_4Cl$/l | g $CaSO_4$/l |
|---|---|
| | $CaSO_4.2H_2O$ |
| 10.8 | 3.9 |
| 24.2 | 5.38 |
| 46.7 | 7.07 |
| 94.5 | 8.80 |
| 149.7 | 10.30 |
| 198.6 | 10.85 |
| 210.0 | 10.88 |
| 275.0 | 10.60 |
| 325.0 | 9.40 |
| $CaSO_4.2H_2O$ + $NH_4Cl$ | |
| 375.3 | 7.38 |

**$Cl^-$ $SO_4^{--}$ $NH_4^+$ $Na^+$**, *v.* p. 276, 277

**$Cl^-$ $SO_4^{--}$ $CO_3^{--}$ $Ca^{++}$ $Na^+$**

$H_2O + CaCO_3 + NaCl + Na_2SO_4$

$t$ = 25°C (59)

| % NaCl | % $Na_2SO_4$ | % $CaCO_3$ |
|---|---|---|
| | | $CaCO_3$ |
| 0.0 | 22.16 | 0.0186 |
| 1.617 | 20.59 | 0.0149 |
| 5.318 | 17.928 | 0.0105 |
| 8.157 | 16.170 | 0.0101 |
| 8.257 | 15.908 | 0.0103 |
| 11.803 | 14.741 | 0.0087 |
| 13.707 | 14.821 | 0.0085 |
| 19.147 | 9.034 | 0.0032 |
| 22.067 | 7.085 | 0.0032 |
| 22.240 | 7.198 | 0.0029 |
| 23.008 | 5.472 | 0.0031 |
| 25.412 | 1.713 | 0.0031 |
| 26.308 | | 0.0026 |

**$Cl^-$ $SO_4^{--}$ $NH_4^+$ (311)**

$H_2O + NH_4Cl + (NH_4)_2SO_4$; A = $NH_4Cl$; B = $(NH_4)_2SO_4$

| Solid phases | Liquid phase | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 25°C | | $t$ = 30°C (340) | | $t$ = 40°C | | $t$ = 60°C | | $t$ = 80°C | |
| | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B |
| | 22.9 | 0 | 28.2 | 0 | 29.5 | | 31.40 | 0 | 35.60 | 0 | 39.6 | 0 |
| $NH_4Cl$ | 17.10 | 13.9 | 22.90 | 11.70 | 24.06 | 12.72 | | | 29.5 | 11.6 | | |
| | | | | | 19.97 | 21.30 | | | | | | |
| $NH_4Cl + (NH_4)_2SO_4$ | 11.30 | 28.40 | 16.40 | 26.2 | 17.76 | 25.75 | 19.4 | 24.8 | 23.6 | 25.80 | 27.4 | 23.2 |
| | 0 | 41.4 | 0 | 43.4 | 14.62 | 28.60 | 0 | 44.8 | 0 | 46.8 | 0 | 48.8 |
| $(NH_4)_2SO_4$ | | | | | 6.86 | 36.15 | | | | | | |
| | | | | | | 44.0 | | | | | | |

**$Cl^-$ $SO_4^{--}$ $NH_4^+$ $Cu^{++}$**

$H_2O + NH_4Cl + CuSO_4$

$t$ = 30°C (340) *v.* Fig. 4

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | $NH_4Cl$ | 0.5 $(NH_4)_2SO_4$ | 0.5$CuCl_2$ | 0.5$CuSO_4$ |
| A | $CuSO_4.5H_2O$ | | | | 57.51 |
| B | $CuCl_2.2H_2O + CuSO_4.5H_2O$ | | | 209.37 | 12.00 |
| C | $CuCl_2.2H_2O$ | | | 209.86 | |
| D | $CuCl_2.2H_2O + 2NH_4Cl.CuCl_2.2H_2O$ | 12.46 | | 211.34 | |
| E | $NH_4Cl + 2NH_4Cl.CuCl_2.2H_2O$ | 138.57 | | 7.32 | |
| F | $NH_4Cl$ | 140.78 | | | |
| G | $NH_4Cl + (NH_4)_2SO_4$ | 105.77 | 124.20 | | |
| H | $(NH_4)_2SO_4$ | | 214.11 | | |
| I | $(NH_4)_2SO_4 + (NH_4)_2SO_4.CuSO_4.6H_2O$ | | 209.93 | | 1.96 |
| J | $CuSO_4.5H_2O + (NH_4)_2SO_4.CuSO_4.6H_2O$ | | 21.41 | | 62.83 |
| P | $NH_4Cl + (NH_4)_2SO_4 + (NH_4)_2SO_4.CuSO_4.6H_2O$ | 105.37 | 125.62 | | 3.53 |
| Q | $NH_4Cl + (NH_4)_2SO_4.CuSO_4.6H_2O + 2NH_4Cl.CuCl_2.2H_2O$ | 134.90 | 38.05 | | 12.96 |
| R | $CuSO_4.5H_2O + (NH_4)_2SO_4.CuSO_4.6H_2O + 2NH_4Cl.CuCl_2.2H_2O$ | 5.53 | 36.24 | 111.67 | |
| S | $CuSO_4.5H_2O + CuCl_2.2H_2O + 2NH_4Cl.CuCl_2.2H_2O$ | | 13.39 | 219.10 | 0.33 |

**$Cl^-$ $SO_4^{--}$ $NH_4^+$ $Na^+$ (311)**

$H_2O + NH_4Cl + Na_2SO_4$; *v.* Figs. 5, 6

| | Solid phases | Liquid phase—M per 1000 M $H_2O$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 0°C; *v.* Fig. 5 | | | | $t$ = 25°C | | | |
| | | $NH_4Cl$ | 0.5$(NH_4)_2SO_4$ | NaCl | 0.5$Na_2SO_4$ | $NH_4Cl$ | 0.5$(NH_4)_2SO_4$ | NaCl | 0.5$Na_2SO_4$ |
| A | $NH_4Cl$ | 99.9 | | | | 132.1 | | | |
| B | $NH_4Cl + (NH_4)_2SO_4$ | 63.2 | 128.5 | | | 96.1 | 124.3 | | |
| C | $(NH_4)_2SO_4$ | | 192.5 | | | | 208.9 | | |
| D | $(NH_4)_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | | 181.6 | | 19.9 | | 193.6 | | 37.1 |
| E | $(NH_4)_2SO_4.Na_2SO_4.4H_2O + Na_2SO_4.10H_2O$ | | 127.2 | | 30.6 | | 60.4 | | 103.7 |
| F | $Na_2SO_4.10H_2O$ | | | | 12.78 | | | | 71.0 |
| | $Na_2SO_4 + Na_2SO_4.10H_2O$ | | | | | | | 61.0 | 54.2 |
| | $Na_2SO_4 + NaCl$ | | | | | | | 97.6 | 24.7 |
| G | $Na_2SO_4.10H_2O + NaCl$ | | | 106.4 | 4.9 | | | | |
| H | $NaCl$ | | | 109.9 | | | | 110.4 | |
| I | $NaCl + NH_4Cl$ | 49.0 | | 87.7 | | 79.7 | | 78.5 | |
| P | $NaCl + NH_4Cl + Na_2SO_4.10H_2O$ | 50.5 | | 82.6 | 10.3 | | | | |
| Q | $NH_4Cl + Na_2SO_4.10H_2O + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | 86.1 | 24.9 | | 37.9 | | | | |
| R | $NH_4Cl + (NH_4)_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | 60.4 | | 124.4 | 18.6 | | | | |
| | $NaCl + NH_4Cl + Na_2SO_4$ | | | | | 90.8 | | 48.9 | 44.3 |
| | $NH_4Cl + Na_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | | | | | 103.8 | | 24.6 | 62.0 |
| | $NH_4Cl + (NH_4)_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | | | | | 90.3 | 115.3 | | 33.8 |
| | $Na_2SO_4 + Na_2SO_4.10H_2O + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | | | | | 15.3 | 42.2 | | 107.9 |

### $Cl^-\ SO_4^{--}\ NH_4^+\ Na^+$.—(*Continued*)

| | Solid phases | Liquid phase—M per 1000 M $H_2O$ | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 40°C; *v.* Fig. 6 | | | | $t$ = 60°C | | | | $t$ = 80°C | | | |
| | | $NH_4Cl$ | $0.5(NH_4)_2SO_4$ | $NaCl$ | $0.5Na_2SO_4$ | $NH_4Cl$ | $0.5(NH_4)_2SO_4$ | $NaCl$ | $0.5Na_2SO_4$ | $NH_4Cl$ | $0.5(NH_4)_2SO_4$ | $NaCl$ | $0.5Na_2SO_4$ |
| A | $NH_4Cl$ | 154.0 | | | | 186.0 | | | | 220.6 | | | |
| B | $NH_4Cl + (NH_4)_2SO_4$ | 117.0 | 121.0 | | | 156.9 | 138.9 | | | 186.5 | 128.0 | | |
| C | $(NH_4)_2SO_4$ | | 221.1 | | | | 239.7 | | | | 259.8 | | |
| D | $(NH_4)_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | | 205.0 | | 49.9 | | | | | | | | |
| E | $Na_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | | 94.5 | | 102.5 | | | | | | | | |
| | $(NH_4)_2SO_4 + Na_2SO_4$ | | | | | | 210.7 | | 87.5 | | 235.0 | | 89.9 |
| F | $Na_2SO_4$ | | | | 122.0 | | | | 114.9 | | | | 110.0 |
| G | $Na_2SO_4 + NaCl$ | | | 103.4 | 22.0 | | | 107.7 | 18.8 | | | 111.7 | 18.46 |
| H | $NaCl$ | | | 112.1 | | | | 114.9 | | | | 116.8 | |
| I | $NaCl + NH_4Cl$ | 100.3 | | 73.3 | | 137.1 | | 80.7 | | 169.7 | | 63.1 | |
| R | $NH_4Cl + (NH_4)_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | 109.3 | 109.3 | | 51.9 | | | | | | | | |
| S | $NH_4Cl + Na_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | 128.3 | 33.3 | | 74.7 | | | | | | | | |
| T | $NaCl + NH_4Cl + Na_2SO_4$ | 114.0 | | 42.2 | 44.8 | 152.2 | | 33.6 | 50.4 | 197.4 | | 19.8 | 59.6 |
| | $NH_4Cl + Na_2SO_4 + (NH_4)_2SO_4$ | | | | | 142.1 | 108.9 | | 63.0 | 188.0 | 83.1 | | 68.1 |

Transition points

| Solid phases | °C | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | $NH_4Cl$ | $0.5(NH_4)_2SO_4$ | $NaCl$ | $0.5Na_2SO_4$ |
| $NH_4Cl + (NH_4)_2SO_4 + Na_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | 50 | 122.2 | 107.4 | | 66.5 |
| $NH_4Cl + NaCl + Na_2SO_4 + Na_2SO_4.10H_2O$ | 11.3 | 71.5 | | 54.4 | 47.3 |
| $NH_4Cl + Na_2SO_4 + Na_2SO_4.10H_2O + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | 11 *ca.* | 69.6 | | 58.9 | 45.9 |

### $Cl^-\ SO_4^{--}\ Th^{++++}$; $Cl^-\ SO_4^{--}\ Tl^+$; $Cl^-\ SO_4^{--}\ Tl^+\ K^+$; *v.* p. 278

### $Cl^-\ SO_4^{--}\ Cu^{++}$ (340, 345): $H_2O + CuCl_2 + CuSO_4$

| Solid phases | Liquid phase | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t$ = 15°C | | $t$ = 25°C | | $t$ = 30°C | | $t$ = 35°C | |
| | % $CuCl_2$ | % $CuSO_4$ | % $CuCl_2$ | % $CuSO_4$ | % $CuCl_2$ | % $CuSO_4$ | % $CuCl_2$ | % $CuSO_4$ |
| $CuCl_2.2H_2O$ | 42.27 | 0.0 | 43.37 | 0.0 | 43.95 | 0.0 | 44.47 | 0.0 |
| | | | | | 43.25 | 1.14 | | |
| $CuCl_2.2H_2O + CuSO_4.5H_2O$ | 41.22 | 1.34 | 41.72 | 2.32 | 43.62 | 2.90 | 42.11 | 3.22 |
| | | 16.03 | | 18.22 | 39.48 | 3.21 | | 21.05 |
| | | | | | 25.67 | 4.77 | | |
| $CuSO_4.5H_2O$ | | | | | 15.88 | 8.93 | | |
| | | | | | 6.58 | 13.62 | | |
| | | | | | 0.0 | 20.32 | | |

### $Cl^-\ SO_4^{--}\ Cu^{++}\ Li^+$; *v.* p. 278

### $Cl^-\ SO_4^{--}\ Cu^{++}\ Na^+$ (345): $H_2O + CuCl_2 + Na_2SO_4$; *v.* Fig. 7

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 15°C | | | | $t$ = 25°C | | | | $t$ = 35°C | | | |
| | | $0.5CuSO_4$ | $0.5CuCl_2$ | $0.5Na_2SO_4$ | $NaCl$ | $0.5CuSO_4$ | $0.5CuCl_2$ | $0.5Na_2SO_4$ | $NaCl$ | $0.5CuSO_4$ | $0.5CuCl_2$ | $0.5Na_2SO_4$ | $NaCl$ |
| A | $CuSO_4.5H_2O$ | 43.1 | | | | 50.3 | | | | 60.2 | | | |
| B | $CuSO_4.5H_2O + CuCl_2.2H_2O$ | 5.1 | 192.2 | | | 9.4 | 199.7 | | | 13.1 | 206.4 | | |
| C | $CuCl_2.2H_2O$ | | 196.2 | | | | 205.2 | | | | 214.5 | | |
| D | $CuCl_2.2H_2O + NaCl$ | | 176.2 | | 57.9 | | 184.1 | | 62.7 | | 197.0 | | 65.7 |
| E | $NaCl$ | | | | 110.1 | | | | 111.6 | | | | 111.4 |
| F | $NaCl + Na_2SO_4$ | | | | | | | 24.7 | 100.2 | | | 22.1 | 102.6 |
| | $NaCl + Na_2SO_4.10H_2O$ | | | 20.2 | 101.6 | | | | | | | | |
| G | $Na_2SO_4 + Na_2SO_4.10H_2O$ | | | | | | | 54.3 | 59.8 | | | | |
| | $Na_2SO_4$ | | | | | | | | | | | 125.2 | |
| H | $Na_2SO_4.10H_2O$ | | | 33.3 | | | | 71.0 | | | | | |
| | $Na_2SO_4 + Na_2Cu(SO_4)_2.2H_2O$ | | | | | | | | | 5.0 | | 122.5 | |
| | $Na_2SO_4.10H_2O + CuSO_4.5H_2O$ | 46.7 | | 40.3 | | | | | | | | | |
| | $Na_2Cu(SO_4)_2.2H_2O + CuSO_4.5H_2O + Na_2SO_4.10H_2O$ | 42.5 | | 22.8 | 20.2 | | | | | | | | |
| I | $Na_2SO_4.10H_2O + Na_2Cu(SO_4)_2.2H_2O$ | | | | | 19.6 | | 74.2 | | | | | |
| J | $Na_2Cu(SO_4)_2.2H_2O + CuSO_4.5H_2O$ | | | | | 52.7 | | 38.3 | | 60.6 | | 31.7 | |
| P | $Na_2Cu(SO_4)_2.2H_2O + Na_2SO_4.10H_2O + Na_2SO_4$ | | | | | 3.9 | | 53.9 | 59.9 | | | | |

**$Cl^-$ $SO_4^{--}$ $Cu^{++}$ $Na^+$.—(*Continued*)**

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 15°C | | | | $t$ = 25°C | | | | $t$ = 35°C | | | |
| | | 0.5$CuSO_4$ | 0.5$CuCl_2$ | 0.5$Na_2SO_4$ | NaCl | 0.5$CuSO_4$ | 0.5$CuCl_2$ | 0.5$Na_2SO_4$ | NaCl | 0.5$CuSO_4$ | 0.5$CuCl_2$ | 0.5$Na_2SO_4$ | NaCl |
| Q | $Na_2Cu(SO_4)_2.2H_2O$ + $Na_2SO_4$ + NaCl | | | | | 7.9 | | 27.0 | 96.3 | 10.3 | | 13.6 | 108 |
| | $Na_2Cu(SO_4)_2.2H_2O$ + $Na_2SO_4.10H_2O$ + NaCl | 10.5 | | 12.7 | 105.7 | | | | | | | | |
| R | $Na_2Cu(SO_4)_2.2H_2O$ + NaCl + $CuCl_2.2H_2O$ | 5.8 | 171.2 | | 57.4 | 6.4 | 179.8 | | 63.0 | 6.8 | 192.5 | | 70.0 |
| S | $Na_2Cu(SO_4)_2.2H_2O$ + $CuCl_2.2H_2O$ + $CuSO_4.5H_2O$ | 10.1 | 176.8 | | 34.7 | 13.1 | 187.8 | | 27.3 | 17.3 | 196.6 | | 21.1 |

**$Cl^-$ $SO_4^{--}$ $Cu^{++}$ $K^+$: $H_2O$ + $CuCl_2$ + $K_2SO_4$; *v.* Fig. 8; $t$ = 30°C (349)**

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | 0.5$CuCl_2$ | 0.5$CuSO_4$ | KCl | 0.5$K_2SO_4$ |
| A | $CuSO_4.5H_2O$ | | 57.50 | | |
| B | $CuSO_4.5H_2O$ + $CuCl_2.2H_2O$ | 210.86 | 12.00 | | |
| C | $CuCl_2.2H_2O$ | 209.90 | | | |
| D | $CuCl_2.2H_2O$ + $CuCl_2.2KCl.2H_2O$ | 238.02 | | 41.95 | |
| E | $CuCl_2.2KCl.2H_2O$ + KCl | 100.12 | | 85.91 | |
| F | KCl | | | 90.30 | |
| G | KCl + $K_2SO_4$ | | | 86.96 | 3.03 |
| H | $K_2SO_4$ | | | | 26.96 |
| I | $K_2SO_4$ + $CuSO_4.K_2SO_4.6H_2O$ | | 4.27 | | 28.87 |
| J | $CuSO_4.K_2SO_4.6H_2O$ + $CuSO_4.5H_2O$ | | 61.31 | | 9.94 |
| P | $K_2SO_4$ + $CuSO_4.K_2SO_4.6H_2O$ + $CuCl_2.K_2SO_4.H_2O$* | 35.94 | | 68.06 | 9.74 |
| Q | $K_2SO_4$ + KCl + $CuCl_2.K_2SO_4.H_2O$ | 26.10 | 7.00 | 89.35 | |
| R | $CuCl_2.K_2SO_4.H_2O$ + $CuSO_4.5H_2O$ + $CuSO_4.K_2SO_4.6H_2O$ | 101.82 | 26.91 | 24.15 | |
| S | KCl + $CuCl_2.2KCl.2H_2O$ + $CuCl_2.K_2SO_4.H_2O$ | 101.96 | | 83.80 | 2.19 |
| T | $CuSO_4.5H_2O$ + $CuCl_2.2H_2O$ + $CuCl_2.K_2SO_4.H_2O$ | 213.96 | 15.30 | 20.47 | |
| U | $CuCl_2.2KCl.2H_2O$ + $CuCl_2.2H_2O$ + $CuCl_2.K_2SO_4.H_2O$ | 233.34 | 4.32 | 38.93 | |

* This salt may be anhydrous; it is possible that there are several salts instead of one, stable within the field assigned to it.

**$Cl^-$ $SO_4^{--}$ $Th^{++++}$**
**$H_2O$ + HCl + $Th(SO_4)_2$**
$t$ = 30°C (235)

| % HCl | % $Th(SO_4)_2$ $Th(SO_4)_2.8H_2O$ |
|---|---|
| 0 | 2.15 |
| 4.55 | 3.541 |
| 6.95 | 3.431 |
| 12.14 | 2.811 |
| 15.71 | 2.360 |
| 18.33 | 2.199 |
| 20.00 | 2.110 |
| 23.9 | 1.277 |

**$Cl^-$ $SO_4^{--}$ $Tl^+$**
**$H_2O$ + TlCl + $Tl_2SO_4$**
$t$ = 25°C (40)

| $M_{TlCl}$/1 | M ½$Tl_2SO_4$/1 TlCl |
|---|---|
| 0.01607 | 0.0 |
| 0.01034 | 0.0200 |
| 0.006772 | 0.0500 |
| 0.004679 | 0.1000 |

**$Cl^-$ $SO_4^{--}$ $Tl^+$ $K^+$**
**$H_2O$ + $Tl_2SO_4$ + KCl**
$t$ = 25°C (40)

| M ½$K_2SO_4$/1 | $M_{TlCl}$/1 TlCl |
|---|---|
| 0.0 | 0.01607 |
| 0.01997 | 0.01779 |
| 0.0500 | 0.01942 |

**$Cl^-$ $SO_4^{--}$ $Tl^+$ $K^+$.—(*Continued*)**

| M ½$K_2SO_4$/1 | $M_{TlCl}$/1 TlCl |
|---|---|
| 0.1000 | 0.02137 |
| 0.3000 | 0.02600 |
| 1.0000 | 0.03416 |

**$Cl^-$ $SO_4^{--}$ $Cu^{++}$ $Li^+$**
**$H_2O$ + $CuCl_2$ + $Li_2SO_4$**
$t$ = 25°C (176)

| $M_{LiCl}$/1 | $M_{CuSO_4}$/1 $CuSO_4.5H_2O$ |
|---|---|
| 2.83 | 1.067 |
| 1.40 | 1.176 |
| 0.73 | 1.257 |
| 0.0 | 1.399 |

**$Cl^-$ $SO_4^{--}$ $Cu^{++}$ $Rb^+$**
**$H_2O$ + $CuCl_2$ + $Rb_2SO_4$**
$t$ = 25°C (176)

| $M_{RbCl}$/1 | $M_{CuSO_4}$/1 $CuSO_4.5H_2O$ |
|---|---|
| 1.094 | 1.568 |
| 0.0 | 1.399 |

**$Cl^-$ $SO_4^{--}$ $Mg^{++}$**
**$H_2O$ + $MgCl_2$ + $MgSO_4$ (36, 192, 193, 241, 257, 375)**

| Solid phases | Liquid phase | | | |
|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 25°C | |
| | % $MgCl_2$ | % $MgSO_4$ | % $MgCl_2$ | % $MgSO_4$ |
| | | 20.63 | | 26.68 |
| | 3.94 | 14.95 | 0.60 | 25.80 |
| $MgSO_4.7H_2O$ | 10.01 | 9.08 | 10.50 | 14.00 |
| | 17.68 | 4.23 | 16.20 | 8.66 |
| | 27.05 | 1.67 | 21.61 | 6.30 |
| $MgSO_4.7H_2O$ + $MgCl_2.6H_2O$ | 33.55 | 1.47 | | |
| $MgSO_4.7H_2O$ + $MgSO_4.6H_2O$ | | | 27.69* | 4.33* |
| | | | 26.06† | 5.01† |
| $MgSO_4.6H_2O$ | | | 31.02 | 3.71 |
| $MgSO_4.6H_2O$ + $MgCl_2.6H_2O$ | | | 34.20m? | 2.29m? |
| $MgSO_4.6H_2O$ + $MgSO_4.5H_2O$ | | | 30.79 | 3.87 |
| $MgSO_4.5H_2O$ + $MgSO_4.4H_2O$ | | | 33.02 | 2.82 |
| $MgSO_4.4H_2O$ + $MgCl_2.6H_2O$ | | | 33.96 | 2.98 |
| $MgCl_2.6H_2O$ | 34.56 | | 35.91 | |

| Solid phases | $t$ = 105°C | | Invariant point $t$ = 116.67° (192) | |
|---|---|---|---|---|
| | | 33.85 | 46.12 | ? |
| $MgSO_4.H_2O$ | 39.12 | 0.80 | | |
| $MgSO_4.H_2O$ + $MgCl_2.6H_2O$ | 42.04 | 0.57 | | |
| $MgCl_2.6H_2O$ | 42.44 | | | |

* Blasdale (36). † Takegami (375).

**$Cl^-$ $SO_4^{--}$ $Mg^{++}$ $Ca^{++}$: $H_2O$ + $MgSO_4$ + $CaCl_2$; $t$ = 26°C (68)**

| g $CaSO_4$/l | g $MgCl_2$/1 | g $CaSO_4$/l | g $MgCl_2$/l |
|---|---|---|---|
| $CaSO_4.2H_2O$ | | | |
| 2.082 | 0 | 8.622 | 121.381 |
| 4.258 | 8.501 | 6.567 | 206.985 |
| 5.692 | 19.175 | 2.774 | 336.986 |
| 7.588 | 46.640 | 1.385 | 441.128 |

$Cl^-$ $SO_4^{--}$ $Mg^{++}$ $Ca^{++}$ $Na^+$ $K^+$

$H_2O + MgCl_2 + CaCl_2 + Na_2SO_4 + KCl$; *v.* Figs. 9, 10, 11, 12 (97, 194, 195)

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | | | |
|---|---|---|---|---|---|---|---|
| | | NaCl | KCl | $0.5MgCl_2$ | $0.5MgSO_4$ | $0.5Na_2SO_4$ | $0.5CaSO_4$ |
| | *t* = 0°C (97); *v.* Fig. 9 | | | | | | |
| A | $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O + NaCl + KCl$ | 93.6 | 25.0 | | | 0.34 | 1.52 |
| B | $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O + NaCl + Na_2SO_4.10H_2O$ | 99.8 | 16.0 | | | 5.20 | 0.64 |
| | $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O + NaCl$ | 98.0 | 23.2 | | | 2.20 | 1.0 |
| D | $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O + NaCl + KCl + MgSO_4.K_2SO_4.6H_2O$ | 36.4 | 16.0 | 62.6 | 20.0 | | 0.12 |
| E | $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O + NaCl + Na_2SO_4.10H_2O + MgSO_4.K_2SO_4.6H_2O$ | Position on diagram assumed | | | | | |
| | *t* = 25°C (97, 194); *v.* Fig. 10 | | | | | | |
| A | $CaSO_4 + CaSO_4.Na_2SO_4 + NaCl$ | 108.0 | | | | 6.0 | 0.5 |
| B | $CaSO_4.K_2SO_4.H_2O + CaSO_4.Na_2SO_4 + Na_2SO_4 + NaCl$ | 94.0 | 11.0 | | | 28.0 | 0 |
| C | $CaSO_4 + CaSO_4.K_2SO_4.H_2O + KCl + NaCl$ | 92.0 | 39.0 | | | | 1.4 |
| D | $CaSO_4.Na_2SO_4 + CaSO_4.K_2SO_4.H_2O + Na_2SO_4 + NaCl + MgSO_4.Na_2SO_4.4H_2O$ | 50.0 | 17.0 | 33.0 | | 44.0 | |
| E* | $CaSO_4.K_2SO_4.H_2O + CaSO_4.Na_2SO_4 + K_2SO_4.MgSO_4.2CaSO_4.2H_2O + NaCl + MgSO_4.Na_2SO_4.4H_2O$ | 46.2 | 14.4 | 63.4 | 38.8 | | 0.58 |
| G* | $CaSO_4.K_2SO_4.H_2O + K_2SO_4.MgSO_4.2CaSO_4.2H_2O + NaCl + KCl + K_2SO_4.MgSO_4.4H_2O$ | 22.2 | 17.6 | 92.4 | 29.0 | | 1.22 |
| I* | $CaSO_4 + K_2SO_4.MgSO_4.2CaSO_4.2H_2O + NaCl + KCl + MgSO_4.KCl.3H_2O$ | 4.0 | 13.0 | 134.2 | 11.8 | | 0.16 |
| J | $CaSO_4 + K_2SO_4.MgSO_4.2CaSO_4.2H_2O + MgSO_4.7H_2O + NaCl + MgSO_4.KCl.3H_2O$ | 14.0 | 13.0 | 104.0 | 35.0 | | 1.6 |
| | Positions of points F, H, K, L, Q on diagrams assumed | | | | | | |
| | *t* = 55°C (97); *v.* Fig. 11 | | | | | | |
| A | $CaSO_4 + CaSO_4.Na_2SO_4 + NaCl$ | 113.6 | | | | 0.40 | 1.8 |
| B | $CaSO_4.Na_2SO_4 + CaSO_4.K_2SO_4.H_2O + NaCl + K_3Na(SO_4)_2$ | 89.6 | 35.4 | | | 16.8 | 0.2 |
| C | $CaSO_4.K_2SO_4.H_2O + NaCl + KCl + K_3Na(SO_4)_2$ | 83.0 | 58.6 | | | 8.2 | 0.154 |
| D | $CaSO_4.K_2SO_4.H_2O + 5CaSO_4.K_2SO_4.H_2O + NaCl + KCl$ | 88.4 | 57.8 | | | 1.0 | 1.2 |
| E | $5CaSO_4.K_2SO_4.H_2O + NaCl + KCl$ | 78.0 | 56.8 | 10† | | | 0.66 |
| F | $CaSO_4 + 5CaSO_4.K_2SO_4.H_2O + CaSO_4.Na_2SO_4 + NaCl$ | 96.2 | 28.0 | | | 5.0 | 0.94 |
| G | $CaSO_4.K_2SO_4.H_2O + 5CaSO_4.K_2SO_4.H_2O + CaSO_4.Na_2SO_4 + NaCl$ | 95.6 | 31.4 | | | 8.4 | 0.42 |
| P | $CaSO_4.Na_2SO_4 + CaSO_4.K_2SO_4.H_2O + K_2SO_4.MgSO_4.2CaSO_4.2H_2O + NaCl + K_3Na(SO_4)_2$ | 84.0 | 33.8 | | 7.8 | 9.4 | 0.38 |
| R | $CaSO_4.K_2SO_4.H_2O + 5CaSO_4.K_2SO_4.H_2O + KCl + NaCl + K_2SO_4.MgSO_4.2CaSO_4.2H_2O$ | 85.6 | 56.4 | 0.6 | 4.2 | | 0.16 |
| S | $CaSO_4? + 5CaSO_4.K_2SO_4.H_2O + K_2SO_4.MgSO_4.2CaSO_4.2H_2O + KCl + NaCl$ | 84.8 | 55.8 | 5.2 | 0.4 | | 1.56 |
| T | $CaSO_4.K_2SO_4.H_2O + CaSO_4.Na_2SO_4 + K_2SO_4.MgSO_4.2CaSO_4.2H_2O + 5CaSO_4.K_2SO_4.H_2O + NaCl$ | 92.2 | 37.6 | 0.6 | 8.6 | | 0.88 |
| | $CaSO_4 + K_2SO_4.MgSO_4.2CaSO_4.2H_2O + KCl + MgKCl_3.6H_2O + NaCl$ | 9.6 | 17.0 | 153.0 | 0.18† | | 1.24 |
| | $CaSO_4 + K_2SO_4.MgSO_4.2CaSO_4.2H_2O + NaCl + MgSO_4.H_2O + MgKCl_3.6H_2O$ | 3.8 | 5.6 | 173.6 | 9.2 | | 0.44 |
| | $CaSO_4 + CaSO_4.Na_2SO_4 + MgSO_4.Na_2SO_4.\frac{1}{2}H_2O + NaCl$ | 16.4 | | 88.0 | 36.2 | | 0.32 |
| | $CaSO_4.Na_2SO_4 + K_2SO_4.MgSO_4.2CaSO_4.2H_2O + MgSO_4.Na_2SO_4.4H_2O + NaCl$ | 83.8 | 29.2 | 2.0 | 41.8 | | 0.06 |
| | *t* = 83°C (97, 195); *v.* Fig. 12 | | | | | | |
| A | $CaSO_4 + CaSO_4.Na_2SO_4 + NaCl$ | 117.4 | | | | 2.6 | 0.58 |
| B | $CaSO_4.Na_2SO_4 + CaSO_4.K_2SO_4.H_2O + NaCl + K_3Na(SO_4)_2$ | 81.0 | 67.0 | | | 13.0 | |
| C | $CaSO_4.K_2SO_4.H_2O + 5CaSO_4.K_2SO_4.H_2O + NaCl + KCl$ | 81.0 | 77.0 | | | 4.0 | 0.36 |
| D | $CaSO_4 + 5CaSO_4.K_2SO_4.H_2O + NaCl + KCl$ | 64.0 | 62.0 | 41.0‡ | | | 0.14 |
| E | $CaSO_4 + CaSO_4.Na_2SO_4 + 5CaSO_4.K_2SO_4.H_2O + NaCl$ | 104.8 | 22.4 | | | 2.8 | 0.56 |
| F | $CaSO_4.K_2SO_4.H_2O + CaSO_4.Na_2SO_4 + 5CaSO_4.K_2SO_4.H_2O + NaCl$ | 82.2 | 65.6 | | | 9.6 | 0.2 |
| P | $CaSO_4 + CaSO_4.Na_2SO_4 + 5CaSO_4.K_2SO_4.H_2O + NaCl + K_2SO_4.MgSO_4.2CaSO_4.2H_2O$ | 90.4 | 37.8 | 7.6 | 5.8 | | 0.40 |
| Q | $CaSO_4.K_2SO_4.H_2O + CaSO_4.Na_2SO_4 + 5CaSO_4.K_2SO_4.H_2O + K_2SO_4.MgSO_4.2CaSO_4.2H_2O + NaCl$ | 78.2 | 70.0 | | 5.6 | 5.8 | 0.20 |

* According to (194). † $CaCl_2$ instead of the salt listed in this column. On the diagram it is represented by the line used for the $SO_4$, but measured in the opposite direction starting from the origin. ‡ $CaCl_2$ instead of the salt listed in this column.

### $Cl^-$ $SO_4^{--}$ $Mg^{++}$ $Ca^{++}$ $Na^+$ $K^+$.—(*Continued*)

In the accompanying diagrams (Figs. 9, 10, 11, and 12) the lighter lines outline the surfaces separating the spaces within which each of the different calcium-containing salts is in stable equilibrium with the solutions represented by different portions of the diagram. The data are in many cases incomplete, and those needed to indicate the spaces within which chloride-containing calcium compounds are stable, are entirely wanting.

The mineralogical names given to the calcium-containing salts listed are as follows:

Gypsum, $CaSO_4.2H_2O$; Anhydrite, $CaSO_4$; Glauberite, $CaSO_4.Na_2SO_4$; Syngenite, $K_2SO_4.CaSO_4.H_2O$; Polyhalite, $K_2SO_4.MgSO_4.2CaSO_4.2H_2O$.

### $Cl^-$ $SO_4^{--}$ $Mg^{++}$ $Na^+$

$H_2O + MgCl_2 + Na_2SO_4$; *v.* Figs. 13, 14, 15, 16, 17 [36, 97, 201, 241, 257, 375]

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | $0.5MgCl_2$ | $0.5MgSO_4$ | NaCl | $0.5Na_2SO_4$ |
| | $t$ = 0°C [241]; *v.* Fig. 13 | | | | |
| A | $MgSO_4.7H_2O$ | | 77.8 | | |
| B | $MgSO_4.7H_2O + MgCl_2.6H_2O$ | 195.4 | 6.8 | | |
| C | $MgCl_2.6H_2O$ | 199.6 | | | |
| D | $MgCl_2.6H_2O + NaCl$ | 196.0 | | 3.4 | |
| E | $NaCl$ | | | 109.8 | |
| F | $NaCl + Na_2SO_4.10H_2O$ | | | 108.4 | 4.0 |
| G | $Na_2SO_4.10H_2O$ | | | | 12.6 |
| H | $Na_2SO_4.10H_2O + MgSO_4.7H_2O$ | | 77.0 | | 13.0 |
| L | $Na_2SO_4.10H_2O + NaCl + MgSO_4.7H_2O$ | 50.4 | 24.0 | 50.6 | |
| M | $NaCl + MgSO_4.7H_2O + MgCl_2.6H_2O$ | 193.0 | 7.8 | 2.2 | |
| | $t$ = 0°C [97] | | | | |
| L | $Na_2SO_4.10H_2O + NaCl + MgSO_4.7H_2O$ | 53.8 | 23.4 | 48.2 | |
| M | $NaCl + MgSO_4.7H_2O + MgCl_2.6H_2O$ | 201.6 | 7.6 | 0.6 | |
| | $t$ = 25°C [36]; *v.* Fig. 14 | | | | |
| A | $MgSO_4.7H_2O$ | | 108.72 | | |
| B | $MgSO_4.7H_2O + MgSO_4.6H_2O$ | 154.0 | 19.06 | | |
| C | $MgSO_4.6H_2O + MgCl_2.6H_2O$ | 204.2 | 10.8 | | |
| D | $MgCl_2.6H_2O$ | 207.8 | | | |
| E | $MgCl_2.6H_2O + NaCl$ | 207.8 | | Tr. | |
| F | $NaCl$ | | | 109.8 | |
| G | $NaCl + Na_2SO_4$ | | | 99.12 | 24.88 |
| H | $Na_2SO_4 + Na_2SO_4.10H_2O$ | | | 38.0 | 55.0 |
| I | $Na_2SO_4.10H_2O$ | | | | 70.82 |
| J | $Na_2SO_4.10H_2O + Na_2SO_4.MgSO_4.4H_2O$ | | 75.92 | | 68.72 |
| K | $Na_2SO_4.MgSO_4.4H_2O + MgSO_4.7H_2O$ | | 95.98 | | 49.94 |
| L | $Na_2SO_4.10H_2O + Na_2SO_4 + Na_2SO_4.MgSO_4.4H_2O$ | | 23.08 | 47.78 | 7.34 |
| M | $Na_2SO_4 + NaCl + Na_2SO_4.MgSO_4.4H_2O$ | | 37.68 | 91.44 | 2.56 |
| N | $Na_2SO_4.MgSO_4.4H_2O + NaCl + MgSO_4.7H_2O$ | 77.42 | 36.0 | 30.16 | |
| O | $MgSO_4.7H_2O + MgSO_4.6H_2O + NaCl$ | 151.0 | 19.56 | 6.78 | |
| P | $MgSO_4.6H_2O + MgCl_2.6H_2O + NaCl$ | 203.7 | 7.56 | 0.56 | |
| | $t$ = 25°C [201] | | | | |
| M | $Na_2SO_4 + NaCl + Na_2SO_4.MgSO_4.4H_2O$ | | 33 | 92 | 6 |
| N | $Na_2SO_4.MgSO_4.4H_2O + NaCl + MgSO_4.7H_2O$ | 14 | 68 | 52 | |
| O | $MgSO_4.7H_2O + MgSO_4.6H_2O + NaCl$ | 106 | 30 | 21 | |
| P | $MgSO_4.6H_2O + MgCl_2.6H_2O + NaCl$ | 104 | 10 | 2 | |
| | $t$ = 25°C [375] | | | | |
| L | $Na_2SO_4.10H_2O + Na_2SO_4 + Na_2SO_4.MgSO_4.4H_2O$ | | 61.58 | 20.32 | 64.50 |
| M | $Na_2SO_4 + NaCl + Na_2SO_4.MgSO_4.4H_2O$ | | 35.35 | 93.83 | 3.60 |
| N | $Na_2SO_4.MgSO_4.4H_2O + NaCl + MgSO_4.7H_2O$ | 71.20 | 17.65 | | 54.39 |
| | $t$ = 25°C [241] | | | | |
| L | $Na_2SO_4.10H_2O + Na_2SO_4 + Na_2SO_4.MgSO_4.4H_2O$ | | 34.40 | 60.8 | 33.2 |
| M | $Na_2SO_4 + NaCl + Na_2SO_4.MgSO_4.4H_2O$ | | 32.0 | 93.6 | 4.4 |
| N | $Na_2SO_4.MgSO_4.4H_2O + NaCl + MgSO_4.7H_2O$ | 60.4 | 30.2 | 44.0 | |
| O | $MgSO_4.7H_2O + MgSO_4.6H_2O + NaCl$ | 155.4 | 19.6 | 4.6 | |
| P | $MgSO_4.6H_2O + MgCl_2.6H_2O + NaCl$ | 200.0 | 19.0 | 5.0 | |
| | $t$ = 25°C [97] | | | | |
| M | $Na_2SO_4 + NaCl + Na_2SO_4.MgSO_4.4H_2O$ | | 33.4 | 92.6 | 6.4 |
| N | $NaCl + MgSO_4.7H_2O + Na_2SO_4.MgSO_4.4H_2O$ | 91.8 | 34.6 | 34.6 | |
| O | $MgSO_4.7H_2O + NaCl + MgSO_4.6H_2O$ | 134.8 | 23.8 | 8.4 | |
| | $NaCl + MgSO_4.6H_2O + MgSO_4.H_2O$ | 158.0 | 19.0 | 5.0 | |
| | $NaCl + MgCl_2.6H_2O + MgSO_4.H_2O$ | 203.8 | 10.2 | 1.8 | |

$Cl^-$ $SO_4^{--}$ $Mg^{++}$ $Na^+$.—(*Continued*)

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | $0.5MgCl_2$ | $0.5MgSO_4$ | NaCl | $0.5Na_2SO_4$ |
| | *t* = 55°C (97); *v.* Fig. 15 | | | | |
| A | $MgSO_4.6H_2O$ | | 157.0 | | |
| D | $MgCl_2.6H_2O$ | 228.0 | | | |
| E | $MgCl_2.6H_2O$ + NaCl | 227.6 | | 1.4 | |
| F | NaCl | | | 113.0 | |
| G | NaCl + $Na_2SO_4$ | | | 107.2 | 18.6 |
| H | $Na_2SO_4$ | | | | 117.0 |
| I | $Na_2SO_4$ + $Na_2SO_4.MgSO_4.4H_2O$ | | 67.8 | | 90.2 |
| J | $Na_2SO_4.MgSO_4.4H_2O$ + $MgSO_4.6H_2O$ | | 150.2 | | 21.0 |
| P | NaCl + $Na_2SO_4$ + $MgSO_4.3Na_2SO_4$ | 2.4 | 31.2 | 101.2 | |
| Q | NaCl + $MgSO_4.3Na_2SO_4$ + $Na_2SO_4.MgSO_4.4H_2O$ | 17.2 | 30.8 | 82.8 | |
| R | NaCl + $Na_2SO_4.MgSO_4.4H_2O$ + $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ | 55.6 | 30.2 | 49.0 | |
| S | NaCl + $MgSO_4.H_2O$ + $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ | 133.4 | 26.2 | 14.0 | |
| T | NaCl + $MgSO_4.H_2O$ + $MgCl_2.6H_2O$ | 224.6 | 210.2 | 1.4 | |
| | *t* = 83°C (97); *v.* Fig. 16 | | | | |
| A | $MgSO_4.H_2O$ | | 190.3 | | |
| C | $MgCl_2.6H_2O$ | 246.0 | | | |
| D | $MgCl_2.6H_2O$ + NaCl | 242 | | 2.0 | |
| E | NaCl | | | 118.0 | |
| F | NaCl + $Na_2SO_4$ | | | 112.0 | 16.8 |
| G | $Na_2SO_4$ | | | | 110.0 |
| H | $Na_2SO_4$ + $MgSO_4.3Na_2SO_4$ | | (54) | | (94) |
| I | $MgSO_4.3Na_2SO_4$ + $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ | | (84) | | (60) |
| J | $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ + $MgSO_4.H_2O$ | | (136) | | (26) |
| P | NaCl + $Na_2SO_4$ + $MgSO_4.3Na_2SO_4$ | 8.8 | 20.8 | 102.2 | |
| Q | NaCl + $MgSO_4.3Na_2SO_4$ + $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ | 44.0 | 25.2 | 70.4 | |
| R | NaCl + $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ + $MgSO_4.H_2O$ | 90.0 | 22.0 | 36.0 | |
| S | NaCl + $MgSO_4.H_2O$ + $MgCl_2.6H_2O$ | 242.0 | 241.8 | 1.2 | |
| | *t* = 105°C (257); *v.* Fig. 17 | | | | |
| A | $MgSO_4.H_2O$ | 0.0 | 153.2 | | |
| B | $MgSO_4.H_2O$ | 246.2 | 4.04 | | |
| C | $MgSO_4.H_2O$ + $MgCl_2.6H_2O$ | 277.0 | 3.0 | | |
| D | $MgCl_2.6H_2O$ | 279.0 | | | |
| E | $MgCl_2.6H_2O$ + NaCl | 279.0 | | Tr. | |
| F | NaCl | | | 121.44 | |
| G | NaCl + $Na_2SO_4$ | | | 115.92 | 16.11 |
| H | $Na_2SO_4$ | | | | 105.98 |
| I | $Na_2SO_4$ + $3Na_2SO_4.MgSO_4$ | | 22.10 | | 99.76 |
| J* | $3Na_2SO_4.MgSO_4$ + $Na_2SO_4.MgSO_4.\frac{5}{2}H_2O$ | | 83.68 | | 64.44 |
| K* | $Na_2SO_4.MgSO_4.\frac{5}{2}H_2O$ + $MgSO_4.H_2O$ | | 128.62 | | 26.14 |
| P | $Na_2SO_4$ + NaCl + $3Na_2SO_4.MgSO_4$ | 9.26 | | 105.56 | 14.78 |
| Q | $3Na_2SO_4.MgSO_4$ + NaCl + $Na_2SO_4.MgSO_4.\frac{5}{2}H_2O$ | 67.28 | | 54.04 | 20.24 |
| R | $Na_2SO_4.MgSO_4.\frac{5}{2}H_2O$ + NaCl + $MgSO_4.H_2O$ | 110.80 | | 19.95 | 22.64 |

* At 103 instead of 105°C.

Invariant points (97)

| °C | Solid phases |
|---|---|
| 13 | $MgCl_2.6H_2O$ + $MgSO_4.7H_2O$ + $MgSO_4.6H_2O$ + NaCl |
| 15 | $Na_2SO_4.10H_2O$ + $MgSO_4.7H_2O$ + $Na_2SO_4.MgSO_4.4H_2O$ + NaCl |
| 15.5 | $Na_2SO_4.10H_2O$ + $Na_2SO_4$ + $Na_2SO_4.MgSO_4.4H_2O$ + NaCl |
| 18 | $MgCl_2.6H_2O$ + $MgSO_4.6H_2O$ + $MgSO_4.H_2O$ + NaCl |
| 31 | $MgSO_4.7H_2O$ + $MgSO_4.6H_2O$ + $Na_2SO_4.MgSO_4.4H_2O$ + NaCl |
| 35.5 | $MgSO_4.6H_2O$ + $MgSO_4.H_2O$ + $Na_2SO_4.MgSO_4.4H_2O$ + NaCl |
| 49 | $Na_2SO_4$ + $Na_2SO_4.MgSO_4.4H_2O$ + $MgSO_4.3Na_2SO_4$ + NaCl |
| 59 | $Na_2SO_4.MgSO_4.4H_2O$ + $MgSO_4.3Na_2SO_4$ + $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ + NaCl |

$Cl^-$ $SO_4^{--}$ $Mg^{++}$ $Na^+$ $K^+$ (97, 189)

$H_2O + MgCl_2 + Na_2SO_4 + KCl$; *v.* Figs. 18, 19, 20, 21

| | Solid phases in addition to NaCl | Liquid phase—M per 1000M $H_2O$ | | | | |
|---|---|---|---|---|---|---|
| | | NaCl | KCl | $0.5MgCl_2$ | $0.5MgSO_4$ | $0.5Na_2SO_4$ |
| | *t* = 0°C (97); *v.* Fig. 18 | | | | | |
| A | $Na_2SO_4.10H_2O$ | 107.8 | | | | 4.4 |
| B | $Na_2SO_4.10H_2O + MgSO_4.7H_2O$ | 48.2 | | 53.8 | 23.4 | |
| C | $MgSO_4.7H_2O + MgCl_2.6H_2O$ | 0.6 | | 201.6 | 7.6 | |
| D | $MgCl_2.6H_2O$ | (1.6) | | 198.2 | | |
| E | $MgCl_2.6H_2O + MgKCl_3.6H_2O$ | (1.6) | 0.4 | 198.0 | | |
| F | $MgKCl_3.6H_2O + KCl$ | 8.0 | 8.0 | 135.8 | | |
| G | $KCl$ | 101.6 | 25.0 | | | |
| H | $KCl + Na_2SO_4.10H_2O$ | 95.0 | 26.4 | | | 6.8 |
| P | $KCl + Na_2SO_4.10H_2O + K_2SO_4.MgSO_4.6H_2O$ | 51.0 | 19.2 | 45.0 | 21.6 | |
| Q | $Na_2SO_4.10H_2O + K_2SO_4.MgSO_4.6H_2O + MgSO_4.7H_2O$ | 44.0 | 15.0 | 48.6 | 31.0 | |
| R | $MgSO_4.7H_2O + K_2SO_4.MgSO_4.6H_2O + KCl$ | 14.8 | 12.4 | 100.2 | 14.8 | |
| S | $MgSO_4.7H_2O + KCl + MgKCl_3.6H_2O$ | 6.2 | 9.2 | 130.0 | 9.0 | |
| T | $MgSO_4.7H_2O + MgKCl_3.6H_2O + MgCl_2.6H_2O$ | 1.4 | 0.4 | 196.8 | 12.0 | |
| | *t* = 25°C (189); *v.* Fig. 19 | | | | | |
| A | $Na_2SO_4$ | 101.0 | | | | 24.9 |
| B | $Na_2SO_4 + Na_2SO_4.MgSO_4.4H_2O$ | 92.6 | | | 33.4 | 6.4 |
| C | $Na_2SO_4.MgSO_4.4H_2O + MgSO_4.7H_2O$ | 34.6 | | 91.8 | 34.6 | |
| D | $MgSO_4.7H_2O + MgSO_4.6H_2O$ | 8.4 | | 135.0 | 24.0 | |
| E | $MgSO_4.6H_2O + MgSO_4.H_2O$ | 5.0 | | 158.0 | 19.0 | |
| F | $MgSO_4.H_2O + MgCl_2.6H_2O$ | 1.8 | | 203.8 | 10.2 | |
| G | $MgCl_2.6H_2O$ | 2.0 | | 212.0 | | |
| H | $MgCl_2.6H_2O + MgKCl_3.6H_2O$ | 2.0 | 1.0 | 210.0 | | |
| I | $MgKCl_3.6H_2O + KCl$ | 4.0 | 11.0 | 141.0 | | |
| J | $KCl$ | 89.0 | 57.4 | | | |
| K | $KCl + K_3Na(SO_4)_2$ | 88.0 | 40.0 | | | 9.0 |
| L | $K_3Na(SO_4)_2 + Na_2SO_4$ | 88.0 | 21.0 | | | 29.0 |
| M | $K_3Na(SO_4)_2 + Na_2SO_4.MgSO_4.4H_2O + Na_2SO_4$ | 84.0 | 16.0 | | 32.0 | 12.0 |
| N | $K_3Na(SO_4)_2 + K_2SO_4.MgSO_4.6H_2O + Na_2SO_4.MgSO_4.4H_2O$ | 55.0 | 21.0 | 33.0 | 37.0 | |
| O | $K_3Na(SO_4)_2 + KCl + K_2SO_4.MgSO_4.6H_2O$ | 46.0 | 28.0 | 43.0 | 28.0 | |
| P | $Na_2SO_4.MgSO_4.4H_2O + K_2SO_4.MgSO_4.6H_2O + K_2SO_4.MgSO_4.4H_2O$ | 44.0 | 21.0 | 46.0 | 38.0 | |
| Q | $K_2SO_4.MgSO_4.6H_2O + K_2SO_4.MgSO_4.4H_2O + KCl$ | 39.0 | 29.0 | 51.0 | 29.0 | |
| R | $Na_2SO_4.MgSO_4.4H_2O + K_2SO_4.MgSO_4.4H_2O + MgSO_4.7H_2O$ | 21.0 | 15.0 | 84.0 | 38.0 | |
| S | $MgSO_4.7H_2O + K_2SO_4.MgSO_4.4H_2O + MgSO_4.KCl.3H_2O$ | 18.0 | 15.0 | 90.0 | 39.0 | |
| T | $K_2SO_4.MgSO_4.4H_2O + KCl + MgSO_4.KCl.3H_2O$ | 19.0 | 19.0 | 94.0 | 29.0 | |
| U | $MgSO_4.KCl.3H_2O + KCl + MgKCl_3.6H_2O$ | 5.0 | 12.0 | 136.0 | 10.0 | |
| V | $MgSO_4.7H_2O + MgSO_4.6H_2O + MgSO_4.KCl.3H_2O$ | 7.0 | 8.0 | 131.0 | 26.0 | |
| W | $MgSO_4.6H_2O + MgSO_4.H_2O + MgSO_4.KCl.3H_2O$ | 3.0 | 4.0 | 154.0 | 20.0 | |
| X | $MgSO_4.H_2O + MgSO_4.KCl.3H_2O + MgKCl_3.6H_2O$ | 2.0 | 2.0 | 171.0 | 16.0 | |
| Y | $MgSO_4.H_2O + MgKCl_3.6H_2O + MgCl_2.6H_2O$ | 2.0 | 1.0 | 200.0 | 10.0 | |
| | *t* = 55°C (97); *v.* Fig. 20 | | | | | |
| A | $Na_2SO_4$ | 107.2 | | | | 18.6 |
| B | $Na_2SO_4 + MgSO_4.3Na_2SO_4$ | 101.2 | | 2.4 | 31.2 | |
| C | $MgSO_4.3Na_2SO_4 + Na_2SO_4.MgSO_4.4H_2O$ | 82.8 | | 17.2 | 30.8 | |
| D | $Na_2SO_4.MgSO_4.4H_2O + Na_2SO_4.MgSO_4.\frac{5}{2}H_2O$ | 49.0 | | 55.6 | 30.2 | |
| E | $Na_2SO_4.MgSO_4.\frac{5}{2}H_2O + MgSO_4.H_2O$ | 14.0 | | 133.4 | 26.2 | |
| F | $MgSO_4.H_2O + MgCl_2.6H_2O$ | 1.4 | | 224.6 | 9.2 | |
| G | $MgCl_2.6H_2O$ | 1.4 | | 227.6 | | |
| H | $MgCl_2.6H_2O + MgKCl_3.6H_2O$ | 1.4 | 1.0 | 228.0 | | |
| I | $MgKCl_3.6H_2O + KCl$ | 7.6 | 16.8 | 156.4 | | |
| J | $KCl$ | 89.0 | 57.4 | | | |
| K | $KCl + K_3Na(SO_4)_2$ | 83.2 | 58.6 | | | 8.0 |
| L | $K_3Na(SO_4)_2 + Na_2SO_4$ | 89.8 | 29.8 | | | 23.4 |
| M | $Na_2SO_4 + K_3Na(SO_4)_2 + MgSO_4.3Na_2SO_4$ | 83.0 | 27.8 | | 17.0 | 13.0 |
| N | $MgSO_4.3Na_2SO_4 + K_3Na(SO_4)_2 + Na_2SO_4.MgSO_4.4H_2O$ | 81.2 | 29.8 | 3.0 | 41.0 | |
| O | $K_3Na(SO_4)_2 + Na_2SO_4.MgSO_4.4H_2O + K_2SO_4.MgSO_4.4H_2O$ | 67.8 | 29.4 | 21.4 | 43.0 | |
| P | $Na_2SO_4.MgSO_4.4H_2O + K_2SO_4.MgSO_4.4H_2O + Na_2SO_4.MgSO_4.\frac{5}{2}H_2O$ | 59.0 | 28.0 | 34.4 | 41.0 | |
| Q | $Na_2SO_4.MgSO_4.\frac{5}{2}H_2O + K_2SO_4.MgSO_4.4H_2O + 2MgSO_4.K_2SO_4$ | 39.8 | 22.2 | 51.4 | 36.0 | |
| R | $K_2SO_4.MgSO_4.4H_2O + K_3Na(SO_4)_2 + KCl$ | 48.6 | 43.6 | 43.8 | 31.6 | |
| S | $K_2SO_4.MgSO_4.4H_2O + 2MgSO_4.K_2SO_4 + MgSO_4.KCl.3H_2O + KCl$ | 39.8 | 39.6 | 59.8 | 32.0 | |
| T | $Na_2SO_4.MgSO_4.\frac{5}{2}H_2O + 2MgSO_4.K_2SO_4 + MgSO_4.H_2O$ | 12.2 | 13.2 | 123.2 | 25.6 | |

$Cl^-$ $SO_4^{--}$ $Mg^{++}$ $Na^+$ $K^+$.—(*Continued*)

| | Solid phases in addition to NaCl | Liquid phase—M per 1000M $H_2O$ | | | | |
|---|---|---|---|---|---|---|
| | | NaCl | KCl | $0.5MgCl_2$ | $0.5MgSO_4$ | $0.5Na_2SO_4$ |
| | *t* = 55°C.—(*Continued*) | | | | | |
| U | $2MgSO_4.K_2SO_4 + MgSO_4.KCl.3H_2O + MgSO_4.H_2O$ | 6.6 | 9.6 | 135.8 | 21.0 | |
| V | $KCl + MgKCl_3.6H_2O + MgSO_4.KCl.3H_2O$ | 3.4 | 17.4 | 154.6 | 6.4 | |
| W | $MgSO_4.KCl.3H_2O + MgKCl_3.6H_2O + MgSO_4.H_2O$ | 6.6 | 12.8 | 162.2 | 6.8 | |
| X | $MgSO_4.H_2O + MgKCl_3.6H_2O + MgCl_2.6H_2O$ | 0.8 | 0.4 | 222.0 | 8.2 | |
| | *t* = 83°C (189); *v.* Fig. 21 | | | | | |
| A | $Na_2SO_4$ | 113.0 | | | | 16.0 |
| B | $Na_2SO_4 + MgSO_4.3Na_2SO_4$ | 102.0 | | 8.8 | 20.8 | |
| C | $MgSO_4.3Na_2SO_4 + MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ | 70.4 | | 44.0 | 25.2 | |
| D | $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O + MgSO_4.H_2O$ | 36.0 | | 90.0 | 22.0 | |
| E | $MgSO_4.H_2O + MgCl_2.6H_2O$ | 1.2 | | 242.0 | 1.8 | |
| F | $MgCl_2.6H_2O$ | 2.0 | | 242.0 | | |
| G | $MgCl_2.6H_2O + MgKCl_3.6H_2O$ | 2.0 | 4.0 | 234.0 | | |
| H | $MgKCl_3.6H_2O + KCl$ | 2.6 | 20.0 | 183.8 | | |
| I | $KCl$ | 81.2 | 78.0 | | | |
| J | $KCl + K_3Na(SO_4)_2$ | 79.0 | 78.0 | | | 9.0 |
| K | $K_3Na(SO_4)_2 + Na_2SO_4$ | 87.0 | 42.0 | | | 22.6 |
| P | $K_3Na(SO_4)_2 + Na_2SO_4 + MgSO_4.3Na_2SO_4$ | 86.0 | 45.0 | | 15.0 | 11.0 |
| Q | $MgSO_4.3Na_2SO_4 + K_3Na(SO_4)_2 + MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ | 69.0 | 53.0 | 17.0 | 35.0 | |
| R | $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O + K_3Na(SO_4)_2 + 2MgSO_4.K_2SO_4$ | 60.0 | 49.0 | 24.0 | 33.0 | |
| S | $2MgSO_4.K_2SO_4 + K_3Na(SO_4)_2 + KCl$ | 59.0 | 67.0 | 26.0 | 20.0 | |
| T | $2MgSO_4.K_2SO_4 + MgSO_4.Na_2SO_4.\frac{5}{2}H_2O + MgSO_4.H_2O$ | 32.0 | 21.0 | 84.0 | 28.0 | |
| U | $2MgSO_4.K_2SO_4 + KCl + MgSO_4.H_2O$ | 22.0 | 30.0 | 152.0 | 10.0 | |
| V | $MgKCl_3.6H_2O + KCl + MgSO_4.H_2O$ | 4.0 | 24.0 | 173.0 | 10.0 | |
| W | $MgKCl_3.6H_2O + MgSO_4.H_2O + MgCl_2.6H_2O$ | 2.0 | 4.0 | 232.0 | 2.0 | |

| °C | At various temperatures (97) | | | | | |
|---|---|---|---|---|---|---|
| 4.5 | $MgSO_4.7H_2O + Na_2SO_4.MgSO_4.4H_2O + K_2SO_4.MgSO_4.6H_2O$ | 43.7 | 14.86 | 51.04 | 31.06 | |
| 12.5 | $K_2SO_4.MgSO_4.6H_2O + MgSO_4.KCl.3H_2O + KCl$ | 7.8 | 10.8 | 126.8 | 16 | |
| 61.5 | $MgCl_2.6H_2O + MgSO_4.H_2O + MgKCl_3.6H_2O$ | 1.8 | 4.0 | 232.4 | 2.20 | |
| 65 | $K_3Na(SO_4)_2 + K_2SO_4.MgSO_4.4H_2O + KCl$ | 48.2 | 47.6 | 42.2 | 33.0 | |
| 69.5 | $MgSO_4.KCl.3H_2O + 2MgSO_4.K_2SO_4 + KCl$ | 24.4 | 36.4 | 95.0 | 19.0 | |

Invariant points (189)

| °C | Solid phases |
|---|---|
| 25.5 | $K_3Na(SO_4)_2 + K_2SO_4.MgSO_4.6H_2O + K_2SO_4.MgSO_4.4H_2O + KCl + NaCl$ |
| 27 | $MgSO_4.6H_2O + MgSO_4.7H_2O + MgSO_4.KCl.3H_2O + K_2SO_4.MgSO_4.4H_2O + NaCl$ |
| 27.5 | $MgSO_4.6H_2O + MgSO_4.7H_2O + K_2SO_4.MgSO_4.4H_2O + Na_2SO_4.MgSO_4.4H_2O + NaCl$ |
| 31.5 | $MgSO_4.H_2O + MgSO_4.6H_2O + MgSO_4.KCl.3H_2O + K_2SO_4.MgSO_4.4H_2O + NaCl$ |
| 32 | $MgSO_4.H_2O + MgSO_4.6H_2O + MgSO_4.K_2SO_4.4H_2O + Na_2SO_4.MgSO_4.4H_2O + NaCl$ |
| 37.5 | $MgSO_4.H_2O + Na_2SO_4.MgSO_4.4H_2O + K_2SO_4.MgSO_4.4H_2O + 2MgSO_4.K_2SO_4 + NaCl$ |
| 46 | $Na_2SO_4 + K_3Na(SO_4)_2 + MgSO_4.3Na_2SO_4 + Na_2SO_4.MgSO_4.4H_2O + NaCl$ |
| 47 | $K_2SO_4.MgSO_4.4H_2O + Na_2SO_4.MgSO_4.4H_2O + MgSO_4.Na_2SO_4.\frac{5}{2}H_2O + 2MgSO_4.K_2SO_4 + NaCl$ |
| 55 | $MgSO_4.KCl.3H_2O + 2MgSO_4.K_2SO_4 + K_2SO_4.MgSO_4.4H_2O + KCl + NaCl$ |
| 59.5 | $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O + Na_2SO_4.MgSO_4.4H_2O + MgSO_4.3Na_2SO_4 + K_3Na(SO_4)_2 + NaCl$ |
| 60.5 | $2MgSO_4.K_2SO_4 + K_2SO_4.MgSO_4.4H_2O + K_3Na(SO_4)_2 + KCl + NaCl$ |
| 72 | $MgSO_4.H_2O + MgKCl_3.6H_2O + KCl + MgSO_4.KCl.3H_2O + NaCl$ |

Parentheses around the first of the solids listed in the systems tabulated below indicate that this solid will disappear if the temperature is increased above the value given for the system. Parentheses around the last of the solids listed indicate that this solid will disappear if the temperature is decreased. The table gives all the data needed for the construction of the paragenesis diagrams of van't Hoff (189).

The author (220) shows how the data obtained by van't Hoff and his coworkers can be represented graphically by the use of a prism with a triangular base, when recalculated to give the molal percentages of the dissolved salts.

It was then possible to calculate by graphical interpolation the transition points given below.

| °C | Solid phases—NaCl and the following: | Liquid phase—M per 1000M $H_2O$ | | | | |
|---|---|---|---|---|---|---|
| | | Mg | $K_2$ | $Na_2$ | $SO_4$ | $Cl_2$ |
| 100 | (Loeweite), Vanthoffite, Kieserite, Langbeinite | 49.0 | 12.3 | 20.0 | 15.4 | 65.9 |
| 90 | Loeweite, Langbeinite, Glaserite, Vanthoffite | 24.5 | 29.0 | 32.5 | 16.0 | 70.0 |
| 83 | (Kainite), Langbeinite, Kieserite, Sylvite | 80.5 | 14.5 | 11.0 | 5.0 | 101.0 |
| 72 | (Kainite), Langbeinite, Kieserite, Carnallite | 87.6 | 9.5 | 3.5 | 4.3 | 96.3 |
| 61.5 | (Leonite), Loeweite, Glaserite, Langbeinite | 33.2 | 15.4 | 36.4 | 21.3 | 63.7 |

$Cl^-\ SO_4^{--}\ Mg^{++}\ Na^+\ K^+$.—(*Continued*)

| °C | Solid phases—NaCl and the following: | Liquid phase—M per 1000M $H_2O$ | | | | |
|---|---|---|---|---|---|---|
| | | Mg | $K_2$ | $Na_2$ | $SO_4$ | $Cl_2$ |
| 60.5 | (Leonite), Sylvite, Glaserite, Langbeinite | 38.7 | 23.0 | 61.7 | 16.4 | 107.0 |
| 59.5 | (Astrakanite), Vanthoffite, Loeweite | 28.7 | 0.0 | ? | 14.8 | ? |
| 59.5 | (Astrakanite), Vanthoffite, Glaserite, Loeweite | 28.0 | 16.2 | 48.0 | 23.3 | 68.9 |
| 56.5 | Astrakanite, Glaserite, Leonite, Loeweite | 32.7 | 15.0 | 34.8 | 22.0 | 60.5 |
| 55 | Leonite, Kainite, Sylvite, (Langbeinite) | 46.0 | 19.7 | 16.4 | 16.4 | 65.7 |
| 49 | Astrakanite, Kieserite, (Loeweite) | 71.5 | 0.0 | 64.0 | 14.0 | 111.5 |
| 49 | Thenardite, Astrakanite, (Vanthoffite) | 15.0 | 0.0 | 47.0 | 12.8 | 49.2 |
| 47 | Astrakanite, Loeweite, Leonite, Langbeinite | 58.4 | 8.9 | 15.8 | 16.1 | 67.0 |
| 46 | Astrakanite, Thenardite, Glaserite, (Vanthoffite) | 9.8 | 10.9 | 50.0 | 15.0 | 55.7 |
| 43 | Astrakanite, Kieserite, Langbeinite, (Loeweite) | 72.6 | 6.1 | 11.5 | 13.0 | 77.2 |
| 37.5 | Kieserite, Langbeinite, Leonite, Astrakanite | 71.4 | 6.1 | 11.0 | 14.2 | 74.3 |
| 37 | Leonite, Kieserite, Kainite, (Langbeinite) | 74.8 | 5.6 | 9.3 | 13.0 | 76.7 |
| 35.5 | (Hexahydrite), Kieserite, Astrakanite | 71.7 | 15.2 | 8.8 | 15.2 | 65.3 |
| 32 | (Hexahydrite), Astrakanite, Leonite, Kieserite | 69.8 | 5.9 | 10.5 | 15.5 | 70.7 |
| 31.5 | Hexahydrite, Kieserite, Kainite, Leonite | 73.0 | 5.6 | 10.8 | 14.4 | 75.0 |
| 31 | (Reichardite), Hexahydrite, Astrakanite | 68.8 | | 8.5 | 16.7 | 60.7 |
| 27.2 | (Reichardite), Astrakanite, Leonite, Hexahydrite | 67.5 | 6.1 | 10.5 | 17.2 | 66.9 |
| 27 | Reichardite, Hexahydrite, Kainite, Leonite | 69.7 | 5.5 | 9.2 | 16.5 | 67.9 |
| 26 | (Schoenite), Glaserite, Astrakanite, Leonite | 34.0 | 13.8 | 24.0 | 15.1 | 56.7 |
| 25.5 | (Schoenite), Glaserite, Sylvite, Leonite | 34.8 | 11.0 | 28.4 | 18.7 | 55.5 |
| 23.5 | Schoenite, Reichardite, Astrakanite, Leonite | 58.8 | 8.0 | 24.0 | 19.4 | 72.4 |
| 23 | Hexahydrite, Kainite, Carnallite, Kieserite | 92.1 | 1.4 | 2.0 | 7.6 | 86.1 |
| 20 | Schoenite, Kainite, Sylvite, (Leonite) | 61.5 | 7.9 | 8.3 | 13.2 | 64.5 |
| 18 | Schoenite, Kainite, Reichardite, (Leonite) | 64.2 | 6.5 | 7.8 | 15.5 | 63.0 |
| 18 | Reichardite, Kainite, Carnallite, (Hexahydrite) | 83.8 | 1.9 | 1.4 | 7.0 | 80.1 |
| 18 | Hexahydrite, Bischoffite, (Kieserite)? | 100.5 | 0.0 | 0.4 | 4.5 | 96.4 |
| 17.5 | Hexahydrite, Bischoffite, Carnallite, (Kieserite) | 105.0 | 0.6 | 0.5 | 5.2 | 103.9 |
| 16.3 | Mirabilite, Glaserite, (Thenardite) | 0.0 | 6.9 | 45.0 | 16.1 | 35.8 |
| 15.3 | Mirabilite, Astrakanite, (Thenardite) | 21.2 | 0.0 | 57.0 | 19.6 | 58.6 |
| 13.5 | Mirabilite, Glaserite, Astrakanite, (Thenardite) | 21.1 | 5.6 | 52.8 | 27.9 | 51.6 |
| 13 | Reichardite, Bischoffite, (Hexahydrite) | 101.0 | | 0.4 | 4.2 | 97.2 |
| 12.5 | Reichardite, Bischoffite, Carnallite, (Hexahydrite) | 105.0 | 0.4 | 0.5 | 5.4 | 101.5 |
| 12.5 | Schoenite, Reichardite, Sylvite, (Kainite) | 64.1 | 6.6 | 9.1 | 12.1 | 60.5 |
| 12 | Sylvite, Reichardite, Carnallite, (Kainite) | 74.3 | 3.1 | 2.5 | 5.9 | 74.5 |
| 7 | Mirabilite, Schoenite, Astrakanite, Glaserite | 33.2 | 8.7 | 23.4 | 20.3 | 45.8 |
| 5 | Mirabilite, Reichardite, (Astrakanite) | 34.0 | 0.0 | 21.5 | 13.5 | 42.0 |
| 4.5 | Mirabilite, Reichardite, Schoenite, (Astrakanite) | 38.5 | 9.8 | 25.7 | 19.3 | 54.7 |
| 4.4 | Mirabilite, Sylvite, (Glaserite) | | 14.6 | 47.0 | 5.2 | 56.4 |
| 3 | Mirabilite, Schoenite, Sylvite, (Glaserite) | 33.0 | 10.0 | 25.5 | 11.0 | 57.5 |

The solid phases whose mineralogical names are used in the preceding table have the following compositions:

Astrakanite, $MgSO_4.Na_2SO_4.4H_2O$
Bischoffite, $MgCl_2.6H_2O$
Carnallite, $MgCl_2.KCl.6H_2O$
Glaserite, approx. $K_3Na(SO_4)_2$
Hexahydrite, $MgSO_4.6H_2O$
Kainite, $MgSO_4.KCl.3H_2O$
Kieserite, $MgSO_4.H_2O$
Langbeinite, $2MgSO_4.K_2SO_4$
Leonite, $MgSO_4.K_2SO_4.4H_2O$
Loeweite, $MgSO_4.Na_2SO_4.5½H_2O$
Mirabilite, $Na_2SO_4.10H_2O$
Reichardite, $MgSO_4.7H_2O$
Schoenite, $MgSO_4.K_2SO_4.6H_2O$
Sylvite, KCl
Thenardite, $Na_2SO_4$
Vanthoffite, $MgSO_4.3Na_2SO_4$

$Cl^-\ SO_4^{--}\ Mg^{++}\ K^+$ (97, 200, 231, 248)

$H_2O + MgCl_2 + K_2SO_4$; *v.* Figs. 22, 23, 24, 25

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | KCl | $0.5MgCl_2$ | $0.5MgSO_4$ | $0.5K_2SO_4$ |
| | $t = 0°C$; *v.* Fig. 22 | | | | |
| A | $MgSO_4.7H_2O$ | | | 80.4 | |
| B | $MgSO_4.7H_2O + MgCl_2.6H_2O$ | | 195.4 | 6.8 | |
| C | $MgCl_2.6H_2O$ | | 199.6 | | |
| D | $MgCl_2.6H_2O + MgKCl_3.6H_2O$ | (0.6) | (198) | | |
| E | $MgKCl_3.6H_2O + KCl$ | 7.30 | 134.2 | | |
| F | KCl | 68.1 | | | |
| G | $KCl + K_2SO_4$ | 67.3 | | | 2.50 |
| H | $K_2SO_4$ | | | | 14.94 |
| I | $K_2SO_4 + K_2SO_4.MgSO_4.6H_2O$ | | | 32.0 | 18.8 |
| J | $K_2SO_4.MgSO_4.6H_2O + MgSO_4.7H_2O$ | | | (83) | (10) |

$Cl^-$ $SO_4^{--}$ $Mg^{++}$ $K^+$.—(*Continued*)

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | KCl | $0.5MgCl_2$ | $0.5MgSO_4$ | $0.5K_2SO_4$ |
| | *t* = 0°C.—(*Continued*) | | | | |
| P | $K_2SO_4 + KCl + K_2SO_4.MgSO_4.6H_2O$ | 39.6 | 37.6 | 10.0 | |
| Q | $KCl + K_2SO_4.MgSO_4.6H_2O + MgSO_4.7H_2O$ | 16.2 | 85.6 | 17.0 | |
| R | $MgSO_4.7H_2O + MgKCl_3.6H_2O + KCl$ | 8.4 | 134.0 | 8.8 | |
| S | $MgSO_4.7H_2O + MgKCl_3.6H_2O + MgCl_2.6H_2O$ | | | | |
| | *t* = 25°C; *v.* Fig. 23 | | | | |
| A | $MgSO_4.7H_2O$ | | | 109 | |
| B | $MgSO_4.7H_2O + MgSO_4.6H_2O$ | | 145.4 | 30.4 | |
| C | $MgSO_4.6H_2O + MgSO_4.H_2O$ | | 177? | 15? | |
| D | $MgSO_4.H_2O + MgCl_2.6H_2O$ | | 202? | 11? | |
| E | $MgCl_2.6H_2O$ | | 208.0 | | |
| F | $MgCl_2.6H_2O + MgKCl_3.6H_2O$ | 2.0 | 207.0 | | |
| G | $MgKCl_3.6H_2O + KCl$ | 11.0 | 142.0 | | |
| H | KCl | 89.3 | | | |
| I | $KCl + K_2SO_4$ | 84.6 | | | 3.14 |
| J | $K_2SO_4$ | | | | 24.9 |
| K | $K_2SO_4 + MgSO_4.K_2SO_4.6H_2O$ | | | 44.0 | 31.6 |
| L | $MgSO_4.K_2SO_4.6H_2O + MgSO_4.7H_2O$ | | | 116.6 | 10.8 |
| P | $K_2SO_4 + KCl + MgSO_4.K_2SO_4.4H_2O$ | 50.0 | 42.0 | 22.0 | |
| Q | $KCl + MgSO_4.K_2SO_4.6H_2O + MgSO_4.KCl.3H_2O + MgSO_4.K_2SO_4.4H_2O$ | 21.2 | 104.2 | 29.2 | |
| R | $MgSO_4.K_2SO_4.4H_2O + MgSO_4.7H_2O + MgSO_4.K_2SO_4.6H_2O$ | | | | |
| S | $MgSO_4.K_2SO_4.4H_2O + MgSO_4.7H_2O + MgSO_4.KCl.3H_2O$ | | (130) | | |
| T | $MgSO_4.KCl.3H_2O + MgKCl_3.6H_2O + KCl$ | 12.8 | 135 | 27.8 | |
| U | $MgSO_4.6H_2O + MgSO_4.7H_2O + MgSO_4.KCl.3H_2O$ | | | | |
| V | $MgSO_4.6H_2O + MgSO_4.KCl.3H_2O + MgKCl_3.6H_2O$ | | (170) | | |
| X | $MgSO_4.H_2O + MgKCl_3.6H_2O + MgCl_2.6H_2O$ | | (200) | | |
| | *t* = 55°C; *v.* Fig. 24 | | | | |
| A | $MgSO_4.6H_2O$ | | | 157 | |
| B | $MgSO_4.6H_2O + MgSO_4.H_2O$ | | (40) | (128) | |
| C | $MgSO_4.H_2O + MgCl_2.6H_2O$ | | (225) | (2) | |
| D | $MgCl_2.6H_2O$ | | 227.2 | | |
| E | $MgCl_2.6H_2O + KMgCl_3.6H_2O$ | 2.4 | 222.0 | | |
| F | $KMgCl_3.6H_2O + KCl$ | 11.4 | 162.0 | | |
| G | KCl | 106.3 | | | |
| H | $KCl + K_2SO_4$ | 102.8 | | | 3.9 |
| I | $K_2SO_4$ | | | | 35.8 |
| J | $K_2SO_4 + MgSO_4.K_2SO_4.4H_2O$ | | | 86.2 | 47.4 |
| K | $MgSO_4.K_2SO_4.4H_2O + MgSO_4.6H_2O$ | | | (159) | (15) |
| P | $K_2SO_4 + KCl + MgSO_4.K_2SO_4.4H_2O$ | 66.6 | 42.4 | 22.8 | |
| Q | $KCl + MgSO_4.K_2SO_4.4H_2O + KCl.MgSO_4.3H_2O$ | 57.4 | 63.2 | 26.4 | |
| R | $MgSO_4.K_2SO_4.4H_2O + 2MgSO_4.K_2SO_4 + KCl.MgSO_4.3H_2O$ | 30.8 | 82.8 | 26.0 | |
| S | $MgSO_4.6H_2O + MgSO_4.H_2O + MgSO_4.K_2SO_4.4H_2O$ | | (?) | (?) | |
| T | $MgSO_4.K_2SO_4.4H_2O + 2MgSO_4.K_2SO_4 + MgSO_4.H_2O$ | 13.8 | 65.0 | 92.2 | |
| U | $2MgSO_4.K_2SO_4 + MgSO_4.KCl.3H_2O + MgSO_4.H_2O$ | 7.2 | 101.8 | 66.2 | |
| V | $MgSO_4.H_2O + MgSO_4.KCl.3H_2O + MgKCl_3.6H_2O$ | | (178) | | |
| W | $KCl + MgKCl_3.6H_2O + MgSO_4.KCl.3H_2O$ | 12.4 | 160.6 | 8.6 | |
| X | $MgSO_4.H_2O + MgCl_2.6H_2O + MgKCl_3.6H_2O$ | | (218) | | |
| | *t* = 85°C; *v.* Fig. 25 | | | | |
| A | $MgSO_4.H_2O$ | | | 201 | |
| B | $MgSO_4.H_2O + MgCl_2.6H_2O$ | | (?) | (?) | |
| C | $MgCl_2.6H_2O$ | | 257.0 | | |
| D | $MgCl_2.6H_2O + MgKCl_3.6H_2O$ | 2.8 | 246.0 | | |
| E | $MgKCl_3.6H_2O + KCl$ | 12.0 | 183.0 | | |
| F | KCl | 127.0 | | | |
| G | $KCl + K_2SO_4$ | 122.2 | | | 4.8 |
| H | $K_2SO_4$ | | | | 45.6 |
| I | $K_2SO_4 + 2MgSO_4.K_2SO_4$ | | | (82) | (54) |
| J | $2MgSO_4.K_2SO_4 + MgSO_4.H_2O$ | | | (180) | (8) |
| P | $K_2SO_4 + 2MgSO_4.K_2SO_4 + KCl$ | 88.4 | 36.3 | 26.8 | |
| Q | $KCl + 2MgSO_4.K_2SO_4 + MgSO_4.H_2O$ | 29.2 | 175.8 | 11.8 | |
| R | $MgSO_4.H_2O + KCl + MgKCl_3.6H_2O$ | | (190) | | |
| S | $MgSO_4.H_2O + MgCl_2.6H_2O + MgKCl_3.6H_2O$ | (?) | (?) | (?) | |

$Cl^-$ $SO_4^{--}$ $Mg^{++}$ $K^+$.—(*Continued*)

| °C | Invariant points (determined by approximate graphical methods) |
|---|---|
| 13 | $MgSO_4.7H_2O + MgSO_4.KCl.3H_2O + MgKCl_3.6H_2O + KCl$ |
| 14 | $MgSO_4.7H_2O + MgSO_4.KCl.3H_2O + MgSO_4.K_2SO_4.6H_2O + KCl$ |
| 18 | $MgSO_4.7H_2O + MgSO_4.KCl.3H_2O + MgKCl_3.6H_2O + MgSO_4.6H_2O$ |
| 20 | $MgSO_4.K_2SO_4.6H_2O + MgSO_4.K_2SO_4.4H_2O + MgSO_4.KCl.3H_2O + MgSO_4.7H_2O$ |
| 25 | $MgSO_4.K_2SO_4.6H_2O + MgSO_4.K_2SO_4.4H_2O + MgSO_4.KCl.3H_2O + KCl$ |
| 25 | $MgSO_4.KCl.3H_2O + MgKCl_3.6H_2O + MgSO_4.H_2O + MgSO_4.6H_2O$ |
| 26 | $MgSO_4.K_2SO_4.4H_2O + MgSO_4.KCl.3H_2O + MgSO_4.7H_2O + MgSO_4.6H_2O$ |
| 35 | $MgSO_4.K_2SO_4.6H_2O + MgSO_4.K_2SO_4.4H_2O + K_2SO_4 + KCl$ |
| 63 | $MgSO_4.K_2SO_4.4H_2O + MgSO_4.KCl.3H_2O + 2MgSO_4.K_2SO_4 + KCl$ |
| 65 | $MgSO_4.K_2SO_4.4H_2O + 2MgSO_4.K_2SO_4 + K_2SO_4 + KCl$ |
| 76 | $MgSO_4.KCl.3H_2O + MgKCl_3.6H_2O + MgSO_4.H_2O + KCl$ |
| 85 | $MgSO_4.KCl.3H_2O + 2MgSO_4.K_2SO_4 + MgSO_4.H_2O + KCl$ |

$Cl^-$ $SO_4^{--}$ $Ca^{++}$ (18, 250)

$H_2O + HCl + CaSO_4$

$t$ = 25°C (18)

| g $CaSO_4$/l | g HCl/l |
|---|---|
| $CaSO_4.2H_2O$ | |
| 2.062 | 0 |
| 4.375 | 3.646 |
| 9.935 | 18.230 |
| 13.565 | 36.46 |
| 17.275 | 72.92 |

$t$ = 25°C (250)

| % HCl* | g $CaSO_4$† (?)‡ |
|---|---|
| 0.77 | 6.405 |
| 1.56 | 8.821 |
| 3.06 | 12.639 |
| 4.70 | 15.342 |
| 6.12 | 16.539 |

$t$ = 101°C

| | |
|---|---|
| 0.77 | 11.209 |

$t$ = 102°C

| | |
|---|---|
| 3.06 | 31.780 |

$t$ = 103°C

| | |
|---|---|
| 6.12 | 46.902 |

* Before saturation.
† Per l of saturated solution.
‡ Composition of solid phase not determined.

$Cl^-$ $SO_4^{--}$ $Ca^{++}$

$H_2O + H_2SO_4 + CaCl_2$

$t$ = 25°C (94)

| M per 1000M $H_2O$* | |
|---|---|
| HCl | $CaSO_4$ |
| $CaSO_4.2H_2O$ | |
| 1.80 | 0.580 |
| 3.86 | 0.857 |
| 7.90 | 1.187 |
| 9.12 | 1.341 |
| 15.81 | 1.724 |
| 18.49 | 1.856 |
| 24.74 | 2.114 |
| 32.79 | 2.303 |
| 37.83 | 2.418 |

* Based on data from (18, 250).

$Cl^-$ $SO_4^{--}$ $Ca^{++}$ (68, 250, 381)

$H_2O + CaCl_2 + CaSO_4$

$t$ = 25°C (68)

| g $CaCl_2$/l | g $CaSO_4$/l |
|---|---|
| $CaSO_4.2H_2O$ (?) | |
| 0.0 | 2.056 |
| 7.489 | 1.244 |
| 11.959 | 1.181 |
| 25.770 | 1.096 |
| 32.045 | 1.080 |
| 51.531 | 1.016 |
| 97.023 | 0.841 |
| 192.705 | 0.465 |
| 280.303 | 0.203 |
| 367.850 | 0.032 |

(250)*

| $t$, °C | % $CaCl_2$ | g $CaSO_4$/ 100cm³ soln. |
|---|---|---|
| 23 | 3.54 | 0.1225 |
| 24 | 6.94 | 0.0963 |
| 25 | 10.35 | 0.0886 |
| 25 | 15.90 | 0.0734 |
| 25 | 16.91 | 0.0702 |
| 101 | 3.54 | 0.1370 |
| 102 | 10.36 | 0.1426 |
| 103 | 16.91 | 0.1301 |

(381)*

| $t$, °C | g $CaCl_2$/ 100g $H_2O$ | g $CaSO_4$/ 100g $H_2O$ |
|---|---|---|
| 15 | 15.0 | 0.063 |
| 21 | 14.7 | 0.086 |
| 39 | 15.0 | 0.091 |
| 72 | 14.9 | 0.100 |
| 94 | 15.2 | 0.110 |
| 138 | 14.7 | 0.070 |
| 170 | 14.82 | 0.031 |
| 195 | 14.70 | 0.022 |

* Composition of solid phase not determined.

$Cl^-$ $SO_4^{--}$ $Ca^{++}$ $Na^+$ (53, 54, 94)

$H_2O + CaCl_2 + Na_2SO_4$

$t$ = 23°C (53)

| g $CaSO_4$/l | g NaCl/l |
|---|---|
| $CaSO_4.2H_2O$ | |
| 2.37 | 0.99 |
| 3.02 | 4.95 |
| 3.54 | 10.40 |
| 4.97 | 30.19 |
| 5.94 | 49.17 |

$Cl^-$ $SO_4^{--}$ $Ca^{++}$ $Na^+$.—(*Cont'd*)

| g $CaSO_4$/l | g NaCl/l |
|---|---|
| $CaSO_4.2H_2O$ | |
| 6.74 | 75.58 |
| 7.50 | 129.50 |
| 7.25 | 197.20 |
| 7.03 | 229.70 |
| 5.68 | 306.40 |
| $CaSO_4.2H_2O$ + NaCl | |
| 5.37 | 315.55 |

Solid phase assumed to be $CaSO_4.2H_2O$ (54)

| g NaCl/l | g $CaSO_4$/l |
|---|---|
| $t$ = 15°C | |
| 0.6 | 2.3 |
| 1.1 | 2.5 |
| 5.1 | 3.1 |
| 10.6 | 3.7 |
| 31.1 | 4.8 |
| 51.4 | 5.6 |
| 139.9 | 7.4 |
| $t$ = 23°C | |
| 0.99 | 2.37 |
| 4.95 | 3.02 |
| 10.40 | 3.54 |
| 30.19 | 4.97 |
| 49.17 | 5.94 |
| 75.58 | 6.74 |
| 129.50 | 7.50 |
| 197.20 | 7.25 |
| 229.70 | 7.03 |
| 306.40 | 5.68 |
| 315.55 | 5.37 |
| $t$ = 26°C | |
| 0 | 2.121 |
| 91.154 | 6.656 |
| 143.989 | 7.179 |
| 148.343 | 7.164 |
| 176.502 | 7.119 |
| 228.756 | 6.794 |
| 274.173 | 6.498 |
| 320.491 | 5.715 |
| $t$ = 30°C | |
| 0.5 | 2.5 |
| 10.3 | 3.6 |
| 30.3 | 5.0 |
| 47.3 | 6.1 |
| 73.4 | 6.9 |
| 126.9 | 7.3 |
| 192.4 | 7.7 |

$Cl^-$ $SO_4^{--}$ $Ca^{++}$ $Na^+$.—(*Cont'd*)

| g NaCl/l | g $CaSO_4$/l |
|---|---|
| Solid phase assumed to be $CaSO_4.2H_2O$ | |
| $t$ = 52°C | |
| 0.5 | 2.3 |
| 1.1 | 2.4 |
| 5.0 | 2.9 |
| 10.10 | 3.5 |
| 29.60 | 5.0 |
| 48.30 | 5.8 |
| 75.70 | 6.6 |
| 131.60 | 7.1 |
| 195.60 | 7.4 |
| $t$ = 70°C | |
| 0.5 | 2.2 |
| 10.0 | 3.4 |
| 29.6 | 4.9 |
| 48.8 | 5.8 |
| 132.7 | 7.4 |
| 195.0 | 7.6 |
| $t$ = 82°C | |
| 0 | 2.07 |
| 1.0 | 2.18 |
| 5.0 | 2.65 |
| 10.1 | 3.30 |
| 29.5 | 4.68 |
| 48.8 | 5.54 |
| 74.9 | 6.23 |
| 128.7 | 7.00 |
| 195.10 | 7.51 |

$t$ = 25°C* (94)

| M per 1000M $H_2O$ | |
|---|---|
| NaCl | $CaSO_4$ |
| $CaSO_4.2H_2O$ | |
| 29.04 | 0.93 |
| 46.83 | 1.02 |
| 48.31 | 1.02 |
| 58.09 | 1.03 |
| 77.14 | 1.99 |
| 90.39 | 0.95 |
| 112.50 | 0.84 |

* By interpolation from Cameron (53, 54) from data at 23 and 26°C.

**$Cl^-$ $SO_4^{--}$ $Ca^{++}$ $Na^+$**

$H_2O + CaSO_4 + NaCl + Na_2SO_4$: $t = 25°C$ (59)

| % NaCl | % $Na_2SO_4$ | % $CaSO_4$ $Na_2SO_4.10H_2O + CaSO_4.2H_2O$ |
|---|---|---|
| 0 | 21.14 | 0.219 |
| 2.28 | 19.65 | 0.180 |
| 4.58 | 18.06 | 0.157 |
| 7.64 | 16.16 | 0.135 |
| $Na_2SO_4.10H_2O + Na_2SO_4 + 2CaSO_4.3Na_2SO_4$ | | |
| 13.63 | 15.44 | 0.025 |
| $Na_2SO_4 + 2CaSO_4.3Na_2SO_4$ | | |
| 16.42 | 12.15 | 0.022 |
| 18.88 | 9.58 | 0.023 |
| $Na_2SO_4 + NaCl + 2CaSO_4.3Na_2SO_4$ | | |
| 22.71 | 6.70 | 0.022 |
| $NaCl + CaSO_4.2H_2O$ | | |
| 25.85 | | 0.467 |
| $CaSO_4.2H_2O + 2CaSO_4.3Na_2SO_4$ | | |
| 11.71 | 14.34 | |
| 12.84 | 13.42 | |
| 14.93 | 10.96 | |
| 17.36 | 8.98 | |
| 22.27 | 5.69 | |
| 23.78 | 3.89 | |

**$Cl^-$ $SO_4^{--}$ $Ca^{++}$ $Na^+$ $K^+$**

$H_2O + CaCl_2 + Na_2SO_4 + K_2SO_4$: $t = 25°$ (94)

M per 1000M $H_2O$

| NaCl | $K_2SO_4$ | $CaSO_4$ $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O$ |
|---|---|---|
| 3.01 | 3.55 | 0.244 |
| 7.75 | 4.01 | 0.272 |
| 16.36 | 4.58 | 0.315 |
| 38.90 | 5.76 | 0.361 |
| 67.40 | 6.56 | 0.288 |
| $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O + NaCl$ | | |
| 111.70 | 7.03 | 0.186 |

**$Cl^-$ $SO_4^{--}$ $Ca^{++}$ $K^+$**

$H_2O + CaCl_2 + K_2SO_4$

$t = 25°C$ (94); *cf.* (104)

M per 1000M $H_2O$

| $K_2SO_4$ | $CaSO_4$ | KCl | $CaCl_2$ $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O$ |
|---|---|---|---|
| 3.05 | 0.232 | 0.506 | |
| 1.60 | 0.327 | 6.01 | |
| | 0.706 | 22.67 | 0.655 |
| | 0.230 | 73.12 | 9.26 |

**$Cl^-$ $SO_4^{--}$ $K^+$**

$H_2O + H_2SO_4 + CaCl_2 + K_2SO_4$: $t = 25°C$ (94)

M per 1000M $H_2O$

| HCl | $K_2SO_4$ | $CaSO_4$ $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O$ |
|---|---|---|
| 6.55 | 5.308 | 0.395 |
| 33.80 | 10.94 | 0.793 |

**$Cl^-$ $SO_4^{--}$ $Sr^{++}$**

$H_2O + HCl + SrSO_4$

$t = 25°C$ (18)

| $M_{HCl}$/l | g $SrSO_4$/l $SrSO_4$ |
|---|---|
| 0.1 | 0.48 |
| 0.5 | 1.26 |
| 1.0 | 1.88 |
| 2.0 | 2.07 |
| 5.0 | 1.61 |

**$Cl^-$ $SO_4^{--}$ $Ba^{++}$**

$H_2O + H_2SO_4 + BaCl_2$

$t = 25°C$ (18)

| $M_{HCl}$/l | g $BaSO_4$/l $BaSO_4$ |
|---|---|
| 0.5 | 0.666 |
| 1.0 | 0.892 |
| 2.0 | 0.101 |
| 5.0 | 0.086 |

**$Cl^-$ $SO_4^{--}$ $Li^+$**

$H_2O + LiCl + Li_2SO_4$

$t = 30°C$ (357)

| % LiCl | % $Li_2SO_4$ $Li_2SO_4.H_2O$ |
|---|---|
| 0.0 | 25.25 |
| 0.96 | 23.60 |
| 2.76 | 20.43 |
| 5.12 | 17.11 |
| 7.92 | 12.94 |
| 12.09 | 7.58 |
| 14.49 | 5.27 |
| 15.30 | 4.48 |
| 21.04 | 1.08 |
| 30.74 | 0.0 |
| $Li_2SO_4.H_2O + LiCl.H_2O$ | |
| 45.97 | 0.0 |
| $LiCl.H_2O$ | |
| 46.10 | 0.0 |

**$Cl^-$ $SO_4^{--}$ $Na^+$: $H_2O + NaCl + Na_2SO_4$ (35, 240, 257, 269, 311, 345, 375)**

| Solid phases | Liquid phase | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $t = 0°C$ | | $t = 4.4°C$ | | $t = 15°C$ | | $t = 16.3°C$ | | $t = 25°C$ | |
| | % NaCl | % $Na_2SO_4$ | % NaCl | % $Na_2SO_4$ | % NaCl | % $Na_2SO_4$ | % NaCl | % $Na_2SO_4$ | % NaCl | % $Na_2SO_4$ |
| NaCl | 26.26 | | | | 26.35 | | | | 26.42 | |
| $NaCl + Na_2SO_4.10H_2O$ | 25.54 | 1.30 | 22.48 | 5.40 | 23.42 | 5.63 | 22.34 | 7.47 | 13.53 | 15.42 |
| $NaCl + Na_2SO_4$ | | | | | | | | | 22.71 | 8.06 |
| $Na_2SO_4.10H_2O$ | 10.70 | 1.50 | | 5.93 | | 11.63 | | 13.04 | 9.74 | 15.65 |
| | | 4.65 | | | | | | | 4.21 | 18.25 |
| | | | | | | | | | | 21.79 |

| Solid phases | Liquid phase | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t = 35°C$ | | $t = 40°C$ | | $t = 50°C$ | | $t = 60°C$ | |
| | % NaCl | % $Na_2SO_4$ | % NaCl | % $Na_2SO_4$ | % NaCl | % $Na_2SO_4$ | % NaCl | % $Na_2SO_4$ |
| NaCl | 26.58 | | 26.70 | | 26.74 | | 27.0 | |
| $NaCl + Na_2SO_4$ | 23.46 | 6.14 | 23.60 | 6.1 | 23.89 | 5.20 | 24.6 | 5.2 |
| $Na_2SO_4$ | | 33.07 | | 32.5 | | 30.95 | | 31.2 |
| | $t = 75°C$ | | $t = 80°C$ | | $t = 100°C$ | | $t = 105°C$ | |
| | % NaCl | % $Na_2SO_4$ | % NaCl | % $Na_2SO_4$ | % NaCl | % $Na_2SO_4$ | % NaCl | % $Na_2SO_4$ |
| NaCl | 27.41 | | 27.5 | | 28.26 | | 28.28 | |
| $NaCl + Na_2SO_4$ | 24.94 | 4.69 | 25.30 | 5.0 | 25.57 | 4.48 | 26.14 | 4.41 |
| $Na_2SO_4$ | | 30.27 | | 30.4 | | 29.42 | | 29.49 |

**$Cl^-$ $SO_4^{--}$ $Na^+$.—(*Continued*)**

Invariant points $NaCl.2H_2O + NaCl + Na_2SO_4.10H_2O$ at $-2.85°C$; $NaCl + Na_2SO_4.10H_2O + Na_2SO_4$ at 17.9°C: NaCl, 22.43 %; $Na_2SO_4$, 7.64%

| $t = 25°C$ (59) | |
|---|---|
| % NaCl | % $Na_2SO_4$ |
| $Na_2SO_4.10H_2O$ | |
| 0 | 22.11 |
| 2.27 | 20.44 |
| 4.42 | 18.59 |
| 6.35 | 16.23 |
| 9.94 | 14.55 |
| 11.61 | 14.42 |

| $t = 25°C$.—(*Continued*) | |
|---|---|
| % NaCl | % $Na_2SO_4$ |
| $Na_2SO_4.10H_2O + Na_2SO_4$ | |
| 13.60 | 14.76 |
| $Na_2SO_4$ | |
| 16.57 | 11.62 |
| 19.15 | 9.11 |
| 21.92 | 7.04 |
| 22.66 | 6.94 |

| $t = 25°C$.—(*Continued*) | |
|---|---|
| % NaCl | % $Na_2SO_4$ |
| $Na_2SO_4 + NaCl$ | |
| 22.96 | 6.86 |
| NaCl | |
| 23.92 | 4.72 |
| 24.91 | 2.44 |
| 26.26 | 0.0 |

$Cl^-$ $SO_4^{--}$ $Na^+$ $K^+$

$H_2O + Na_2SO_4 + KCl$ (35, 97, 269)

*v.* Figs. 26, 27, 28

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | NaCl | KCl | $0.5Na_2SO_4$ | $0.5K_2SO_4$ |
| | $t$ = 0°C (35); *v.* Fig. 26 | | | | |
| A | $Na_2SO_4.10H_2O$ | | | 11.70 | |
| B | $Na_2SO_4.10H_2O + NaCl$ | 106.6 | | 4.64 | |
| C | $NaCl$ | 107.7 | | | |
| D | $NaCl + KCl$ | 97.19 | 25.50 | | |
| E | $KCl$ | | 68.10 | | |
| F | $KCl + K_2SO_4$ | | 67.32 | | 2.50 |
| G | $K_2SO_4$ | | | | 14.94 |
| H | $K_2SO_4 + Na_2SO_4.10H_2O$ | | | 16.00 | 18.60 |
| P | $Na_2SO_4.10H_2O + K_2SO_4 + K_3Na(SO_4)_2$ | 23.00 | 32.00 | 12.00 | |
| Q | $K_2SO_4 + KCl + K_3Na(SO_4)_2$ | 38.8 | 43.0 | 5.74 | |
| R | $KCl + K_3Na(SO_4)_2 + Na_2SO_4.10H_2O$ | 83.4 | 24.3 | | 6.70 |
| S | $KCl + NaCl + Na_2SO_4.10H_2O$ | 98.9 | 18.9 | | 7.50 |
| | $t$ = 0°C (97) | | | | |
| R | $KCl + K_3Na(SO_4)_2 + Na_2SO_4.10H_2O$ | 87.4 | 28.4 | | 7.00 |
| S | $KCl + NaCl + Na_2SO_4.10H_2O$ | 95.0 | 26.4 | | 6.80 |
| | $t$ = 0°C (269) | | | | |
| | $K_2SO_4 + K_3Na(SO_4)_2$ | | 15.0 | | 20.00 |
| | $Na_2SO_4.10H_2O + K_3Na(SO_4)_2$ | | 20.0 | | 20.00 |
| | $t$ = 25°C (35); *v.* Fig. 27 | | | | |
| A | $Na_2SO_4.10H_2O$ | | | 70.8 | |
| B | $Na_2SO_4.10H_2O + Na_2SO_4$ | 58.1 | | 55.0 | |
| C | $Na_2SO_4 + NaCl$ | 99.1 | | 24.9 | |
| D | $NaCl$ | 109.8 | | | |
| E | $NaCl + KCl$ | 92.1 | 39.3 | | |
| F | $KCl$ | | 89.3 | | |
| G | $KCl + K_2SO_4$ | | 88.2 | | 3.0 |
| H | $K_2SO_4$ | | | | 24.9 |
| I | $K_2SO_4 + K_3Na(SO_4)_2$ | | | 16.96 | 27.4 |
| J | $Na_2SO_4.10H_2O + K_3Na(SO_4)_2$ | | | 78.5 | 19.3 |
| P | $K_2SO_4 + KCl + K_3Na(SO_4)_2$ | 20.9 | 71.0 | | 4.6 |
| Q | $KCl + NaCl + K_3Na(SO_4)_2$ | 86.2 | 39.6 | 8.9 | |
| R | $NaCl + Na_2SO_4 + K_3Na(SO_4)_2$ | 107.5 | | 5.7 | 22.8 |
| S | $Na_2SO_4.10H_2O + Na_2SO_4 + K_3Na(SO_4)_2$ | 43.8 | | 56.5 | 15.1 |
| | $t$ = 50°C (35) | | | | |
| | $Na_2SO_4$ | | | 113.7 | |
| | $Na_2SO_4 + NaCl$ | 103.9 | | 18.5 | |
| | $NaCl$ | 112.5 | | | |
| | $NaCl + KCl$ | 89.6 | 53.2 | | |
| | $KCl$ | | 104.2 | | |
| | $KCl + K_2SO_4$ | | 102.0 | | 3.8 |
| | $K_2SO_4$ | | | | 35.2 |
| | $K_2SO_4 + K_3Na(SO_4)_2$ | | | 17.2 | 35.9 |
| | $Na_2SO_4 + K_3Na(SO_4)_2$ | | | 116.0 | 19.4 |
| | $K_2SO_4 + KCl + K_3Na(SO_4)_2$ | 14.4 | 84.7 | | 5.3 |
| | $KCl + NaCl + K_3Na(SO_4)_2$ | 82.7 | 54.0 | 8.0 | |
| | $NaCl + Na_2SO_4 + K_3Na(SO_4)_2$ | 80.3 | 29.2 | | 23.50 |
| | $t$ = 55°C (97) | | | | |
| | $NaCl + Na_2SO_4 + K_3Na(SO_4)_2$ | 89.8 | 29.8 | 23.4 | |
| | $NaCl + KCl + K_3Na(SO_4)_2$ | 83.2 | 58.6 | 8.0 | |
| | $t$ = 75°C (35) | | | | |
| | $Na_2SO_4$ | | | 110.1 | |
| | $Na_2SO_4 + NaCl$ | 109.3 | | 16.96 | |
| | $NaCl$ | 116.3 | | | |
| | $NaCl + KCl$ | 85.9 | 70.2 | | |
| | $KCl$ | | 120.0 | | |
| | $KCl + K_2SO_4$ | | 117.8 | | 4.4 |
| | $K_2SO_4$ | | | | 43.0 |
| | $K_2SO_4 + K_3Na(SO_4)_2$ | | | 25.6 | 38.46 |
| | $Na_2SO_4 + K_3Na(SO_4)_2$ | | | 106.7 | 24.34 |

**$Cl^-$ $SO_4^{--}$ $Na^+$ $K^+$.—(*Continued*)**

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | NaCl | KCl | $0.5Na_2SO_4$ | $0.5K_2SO_4$ |
| | *t* = 75°C.—(*Continued*) | | | | |
| | $K_2SO_4 + KCl + K_3Na(SO_4)_2$ | 17.6 | 102.9 | | 5.86 |
| | $KCl + NaCl + K_3Na(SO_4)_2$ | 78.46 | 71.0 | 8.46 | |
| | $NaCl + Na_2SO_4 + K_3Na(SO_4)_2$ | 87.1 | 38.0 | 22.5 | |
| | *t* = 83°C (204) | | | | |
| | $NaCl + Na_2SO_4 + K_3Na(SO_4)_2$ | 87.2 | 42.4 | 22.5 | |
| | $KCl + NaCl + K_3Na(SO_4)_2$ | 78.8 | 77.6 | 8.8 | |
| | *t* = 100°C (35); *v.* Fig. 28 | | | | |
| A | $Na_2SO_4$ | | | 105.7 | |
| B | $Na_2SO_4 + NaCl$ | 112.7 | | 16.24 | |
| C | $NaCl$ | 121.6 | | | |
| D | $NaCl + KCl$ | 84.4 | 85.0 | | |
| E | $KCl$ | | 135.8 | | |
| F | $KCl + K_2SO_4$ | | 131.5 | | 5.86 |
| G | $K_2SO_4$ | | | | 48.1 |
| H | $K_2SO_4 + K_3Na(SO_4)_2$ | | | 34.4 | 42.4 |
| I | $Na_2SO_4 + K_3Na(SO_4)_2$ | | | 105.8 | 28.2 |
| P | $K_2SO_4 + KCl + K_3Na(SO_4)_2$ | 9.82 | 120.8 | | 6.48 |
| Q | $KCl + NaCl + K_3Na(SO_4)_2$ | 78.5 | 87.3 | 9.56 | |
| R | $NaCl + Na_2SO_4 + K_3Na(SO_4)_2$ | 110.4 | 24.6 | | 22.7 |
| °C | Invariant points (269) | | | | |
| 4.4 | $NaCl + KCl + Na_2SO_4.10H_2O + K_3Na(SO_4)_2$ | 92.8 | 28.8 | 10.84 | |
| 16.3 | $NaCl + Na_2SO_4 + Na_2SO_4.10H_2O + K_3Na(SO_4)_2$ | 89.6 | 18.4 | 32.60 | |

**$Cl^-$ $SO_4^{--}$ $K^+$ (35, 269): $H_2O + KCl + K_2SO_4$**

| Solid phases | Liquid phase | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *t* = 0°C | | *t* = 4.4°C | | *t* = 16.3°C | | *t* = 25°C | | *t* = 50°C | | *t* = 75°C | | *t* = 100°C | |
| | % KCl | % $K_2SO_4$ | % KCl | % $K_2SO_4$ | % KCl | % $K_2SO_4$ | % KCl | % $K_2SO_4$ | % KCl | % $K_2SO_4$ | % KCl | % $K_2SO_4$ | % KCl | % $K_2SO_4$ |
| KCl | 21.99 | | 23.22 | | 25.35 | | 26.99 | | 30.12 | | 33.21 | | 35.98 | |
| $KCl + K_2SO_4$ | 21.59 | 0.94 | 22.55 | 0.74 | 24.15 | 1.08 | 26.51 | 1.18 | 29.32 | 1.28 | 32.31 | 1.45 | 34.61 | 1.80 |
| $K_2SO_4$ | | 6.74 | | 8.42 | | 9.22 | | 10.73 | | 14.59 | | 17.22 | | 18.98 |

**$H_2O + KCl + K_2SO_4$ (303)**

| °C | % KCl | % $K_2SO_4$ | °C | % KCl | % $K_2SO_4$ |
|---|---|---|---|---|---|
| | $KCl + K_2SO_4$ | | | | |
| 10 | 23.4 | 1.0 | 60 | 30.1 | 1.33 |
| 20 | 24.8 | 1.06 | 70 | 31.3 | 1.39 |
| 30 | 26.2 | 1.14 | 80 | 32.5 | 1.47 |
| 40 | 27.6 | 1.20 | 90 | 33.7 | 1.54 |
| 50 | 28.9 | 1.27 | 100 | 34.7 | 1.61 |

**$Cl^-$ $HSO_3^-$ $C_{10}H_7NH_2^+$ $C_{10}H_7SO_3^-$ (391)**

$H_2O + HCl + C_{10}H_7NH_2.C_{10}H_7SO_3H$, $\alpha$- and $\beta$-Naphthylamine naphthalene-$\alpha$- and $\beta$-sulfonates

| °C | Liquid phase—g per 100g solvent (0.01 *N* HCl) | | | | |
|---|---|---|---|---|---|
| | $\alpha$, $\alpha$-salt | $\alpha$, $\beta$-salt | $\beta$, $\beta$-salt | $\beta$, $\alpha$-salt | Fe, $\beta$-salt* |
| 25 | 0.3125 | 0.2039 | 0.0563 | 0.1735 | 0.3022 |
| 30 | 0.4131 | 0.2391 | 0.0599 | 0.2078 | 0.3470 |
| 35 | 0.5007 | 0.2985 | 0.0736 | 0.2533 | 0.4233 |
| 40 | 0.5991 | 0.3675 | 0.0816 | 0.3150 | 0.5135 |
| 45 | 0.7340 | 0.4420 | 0.1008 | 0.3985 | 0.6174 |
| 50 | 0.8356 | 0.5398 | 0.1171 | 0.4954 | 0.7711 |
| 55 | 0.9733 | 0.6246 | 0.1434 | 0.6044 | 0.9171 |
| 60 | 1.113 | 0.6542 | 0.1656 | 0.7391 | 1.056 |
| 65 | 1.305 | | | | |
| 70 | 1.368 | 0.8493 | 0.2393 | 1.141 | 1.393 |
| 80 | 1.571 | 1.283 | 0.3395 | 1.829 | 1.985 |
| 90 | 2.028 | 2.132 | 0.4667 | 2.980 | 2.882 |
| 98 | 2.651 | 2.951 | 0.6218 | 4.790 | 3.764 |

* Anhydrous. Composition of this salt given (391) since it is used to identify the $\beta$-acid.

**$Cl^-$ $HSO_3^-$ $C_{10}H_7NH_2^+$ $C_{10}H_6(SO_3)_2^{--}$ (391)**

$H_2O + HCl + (C_{10}H_7NH_2)_2.C_{10}H_6(SO_3H)_2$, $\alpha$-Naphthylamine naphthalenedisulfonate

| °C | Liquid phase—g per 100g solvent (0.01 *N* HCl) | | | |
|---|---|---|---|---|
| | 1, 5-sulfonate | 1, 6-sulfonate | 2, 6-sulfonate | 2, 7-sulfonate |
| 25 | 0.0605 | 2.29 | 0.5170 | 0.8689 |
| 30 | 0.0694 | 3.20 | 0.6082 | 0.9805 |
| 35 | 0.0853 | 4.21 | 0.7178 | 1.1620 |
| 40 | 0.0972 | 7.15 | 0.8943 | 1.364 |
| 45 | 0.1033 | 9.59 | 1.005 | 1.599 |
| 50 | 0.1253 | | 1.161 | 1.931 |
| 55 | 0.1563 | | 1.288 | 2.405 |
| 60 | 0.1638 | | 1.462 | 3.386 |
| 70 | 0.2212 | | 2.062 | 10.300 |
| 80 | 0.2902 | | 2.881 | 35.20 |
| 90 | 0.4010 | | 3.770 | 87.70 |
| 98 | 0.4635 | | 4.724 | |

$H_2O + HCl + (C_{10}H_7NH_2)_2.C_{10}H_6(SO_3H)_2$, $\beta$-Naphthylamine naphthalenedisulfonate

| °C | Liquid phase—g per 100g solvent (0.01*N* HCl) | | | |
|---|---|---|---|---|
| | 1, 5-sulfonate | 1, 6-sulfonate | 2, 6-sulfonate | 2, 7-sulfonate |
| 25 | 0.0727 | 0.2952 | 0.0296 | 0.1327 |
| 30 | 0.0765 | 0.3898 | 0.0386 | 0.1454 |
| 35 | 0.0887 | 0.4934 | 0.0412 | 0.1917 |
| 40 | 0.1107 | 0.5600 | 0.0422 | 0.2160 |
| 45 | 0.1233 | 0.6789 | 0.0594 | 0.2737 |

### $Cl^-$ $HSO_3^-$ $C_{10}H_7NH_2^+$ $C_{10}H_6(SO_3)_2^{--}$.—(*Continued*)

| °C | Liquid phase—g per 100g solvent (0.01*N* HCl) | | | |
|---|---|---|---|---|
| | 1, 5-sulfonate | 1, 6-sulfonate | 2, 6-sulfonate | 2, 7-sulfonate |
| 50 | 0.1493 | 0.8105 | 0.0614 | 0.3312 |
| 55 | 0.1701 | 0.9546 | 0.0702 | 0.4241 |
| 60 | 0.1882 | 1.245 | 0.0806 | 0.4684 |
| 70 | 0.2562 | 1.852 | 0.1093 | 0.6791 |
| 80 | 0.3204 | 2.695 | 0.1626 | 0.9735 |
| 90 | 0.4427 | 4.019 | 0.2207 | 1.433 |
| 98 | 0.5887 | 5.726 | 0.2943 | 1.861 |

### $Cl^-$ $Te^{++++}$

$H_2O + HCl + TeO_2$

$t$ = 18°C (226)*

| $M_{HCl}$/l | $M_{TeO_2}$/l |
|---|---|
| $TeO_2$ | |
| 0.10 | 0.00057 |
| 0.22 | 0.0012 |
| 0.46 | 0.0037 |
| 0.92 | 0.0091 |
| $H_2TeO_3$ | |
| 0.0 | 0.0006 |

* The author also determined concentrations of $Te^{++++}$ in solutions made by adding $H_2TeO_3$ and HCl to water, and showed that $H_2TeO_3$ is changed to $Te^{++++}$ and $H_2O$ by slight increase in $H^+$. Assuming $H_2TeO_3 + 4H^+ \rightarrow Te^{++++} + 3H_2O$ he calculated the following constants; $K_1 = (Te^{++++}) \div (H^+)^4 = 300$ with $H_2TeO_3$ as a solid phase. $K_2 = (Te^{++++}) \div (H^+)^4 = 0.021$ with $TeO_2$ as a solid phase. Assuming $H_2TeO_3$ is a base he determined the dissociation constant; $K_3 = (Te^{++++}) \times (OH^-)^4 \div (H_2TeO_3) = 1.5 \times 10^{-46}$.

### $Cl^-$ $NO_3^-$ $C_2O_4^{--}$ $Ca^{++}$ $K^+$

$H_2O + HNO_3 + CaCl_2 + K_2C_2O_4$

$t$ = 24°C (172)

| g $KNO_3$/l* | g CaO/l* |
|---|---|
| $CaC_2O_4$† | |
| 0 | 1.1873 |
| 0.5055 | 1.1973 |
| 1.011 | 1.2000 |
| 2.022 | 1.2086 |
| 4.044 | 1.2193 |
| 10.110 | 1.260 |
| 20.22 | 1.321 |
| 30.33 | 1.3686 |
| 40.44 | 1.4366 |
| 50.55 | 1.4946 |

* HCl = 18.23g/l throughout the liquid phases.

† Authors do not state whether solid phase was hydrated.

### $Cl^-$ $NO_3^-$ $Tl^+$

$H_2O + HNO_3 + TlCl$

$t$ = 25°C (185)

| % $HNO_3$ | % TlCl |
|---|---|
| TlCl | |
| 0.0 | 0.3967 |
| 3.075 | 0.5830 |
| 6.114 | 0.6644 |
| 11.914 | 0.7607 |
| 22.17 | 0.8735 |

### $Cl^-$ $NO_3^-$ $Tl^+$ $K^+$

$H_2O + TlNO_3 + KCl$

$t$ = 25°C (40)

| $M_{KNO_3}$/l | $M_{TlCl}$/l |
|---|---|
| TlCl | |
| 0.0 | 0.01607 |
| 0.02001 | 0.01716 |
| 0.0500 | 0.01826 |
| 0.10005 | 0.01961 |
| 0.3002 | 0.02313 |
| 1.005 | 0.3072 |

### $Cl^-$ $NO_3^-$ $Ag^+$

$H_2O + AgCl + AgNO_3$

$t$ = 20°C (249)

| % AgCl* | % $AgNO_3$* |
|---|---|
| AgCl | |
| 0.09137 | 66.67 |
| 0.05758 | 57.11 |
| 0.03608 | 50.00 |
| 0.01607 | 40.00 |
| 0.00979 | 33.33 |

* Solution also contained small amounts of NaCl.

### $Cl^-$ $NO_3^-$ $Ca^{++}$

$H_2O + CaCl_2 + Ca(NO_3)_2$

$t$ = ? (19)

| % $CaCl_2$ | % $Ca(NO_3)_2$ |
|---|---|
| $Ca(NO_3)_2.4H_2O$ | |
| 4.60 | 55.00 |
| 7.27 | 52.90 |
| 11.05 | 53.40 |
| 10.70 | 54.40 |
| 7.57 | 65.28 |
| $CaCl_2.4H_2O$ | |
| 42.35 | 17.03 |
| 44.70 | 11.45 |
| 45.00 | 10.81 |

### $Cl^-$ $NO_3^-$ $Ca^{++}$ $K^+$

$H_2O + CaCl_2 + KNO_3$

$t$ = 30°C (19)*

| % KCl | % $Ca(NO_3)_2$ |
|---|---|
| KCl + $KNO_3$ | |
| 24.6 | 16.2 |
| $KNO_3$ + $Ca(NO_3)_2$ (?) | |
| 18.20 | 45.80 |
| $Ca(NO_3)_2$ (?) + $Ca(NO_3)_2.4H_2O$ | |
| 9.00 | 73.50 |
| % $CaCl_2$ | % $KNO_3$ |
| KCl + $KNO_3$ | |
| 19.6 | 26.00 |
| KCl + $CaCl_2.4H_2O\alpha$ | |
| 50.70 | 5.20 |

* A probable diagram for this system based upon extrapolation of the data given above and those given for the four three-component systems is given by the author.

### $Cl^-$ $NO_3^-$ $Sr^{++}$

$H_2O + HNO_3 + SrCl_2$

$t$ = 25°C (161)

M per 1000g $H_2O$

| $HNO_3$ | $0.5SrCl_2$ |
|---|---|
| $SrCl_2.6H_2O$ | |
| 0.0 | 7.034 |
| 0.1771 | 7.028 |
| 0.3521 | 7.034 |
| 1.277 | 7.034 |

### $Cl^-$ $NO_3^-$ $Sr^{++}$

$H_2O + SrCl_2 + Sr(NO_3)_2$

$t$ = 25°C (161)

| % $SrCl_2$ | % $Sr(NO_3)_2$ |
|---|---|
| $SrCl_2.6H_2O$ | |
| 35.798 | 0.0 |
| 35.500 | 0.923 |
| 34.461 | 3.769 |
| 33.299 | 6.947 |
| 28.983 | 18.455 |

### $Cl^-$ $NO_3^-$ $Sr^{++}$ $Na^+$

$H_2O + SrCl_2 + NaNO_3$

$t$ = 25°C (161)

M per 1000g $H_2O$

| $NaNO_3$ | $0.5SrCl_2$ |
|---|---|
| $SrCl_2.6H_2O$ | |
| 0.0 | 7.034 |
| 0.3621 | 7.198 |
| 0.5010 | 7.270 |
| 3.5530 | 7.276 |
| 6.856 | 6.844 |

### $Cl^-$ $NO_3^-$ $Sr^{++}$ $K^+$

$H_2O + Sr(NO_3)_2 + KCl$

$t$ = 25°C (161)

M per 1000g $H_2O$

| $KNO_3$ | $0.5SrCl_2$ |
|---|---|
| $SrCl_2.6H_2O$ | |
| 0.0 | 7.034 |
| 0.09796 | 7.122 |
| 0.4755 | 7.406 |

### $Cl^-$ $NO_3^-$ $Ba^{++}$

$H_2O + BaCl_2 + Ba(NO_3)_2$

$t$ = 30°C (88)

| % $BaCl_2$ | % $Ba(NO_3)_2$ |
|---|---|
| $BaCl_2.2H_2O$ | |
| 27.60 | 0 |
| 27.38 | 1.58 |
| 26.91 | 4.13 |
| 26.64 | 5.37 |
| $BaCl_2.2H_2O$ + $Ba(NO_3)_2$ | |
| 26.11* | 7.88* |
| $Ba(NO_3)_2$ | |
| 22.70 | 7.94 |
| 16.14 | 7.92 |
| 13.75 | 8.20 |
| 6.06 | 9.55 |
| 0.0 | 10.33 |

$t$ = 20°C (126)

| $BaCl_2.2H_2O$ | |
|---|---|
| 26.07 | 1.31 |
| $BaCl_2.2H_2O$ + $Ba(NO_3)_2$ | |
| 25.09 | 6.93 |
| $Ba(NO_3)_2$ | |
| 20.81 | 6.54 |
| 12.31 | 6.72 |
| 7.51 | 7.17 |

* Mean of several results.

### $Cl^-$ $NO_3^-$ $Ba^{++}$ $Na^+$: $H_2O + BaCl_2 + NaNO_3$; *v.* Fig. 29

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | 0.5Ba-$Cl_2$ | 0.5Ba-$(NO_3)_2$ | NaCl | $NaNO_3$ |
| | $t$ = 30°C (88) | | | | |
| A | $Ba(NO_3)_2$ | | 15.92 | | |
| B | $Ba(NO_3)_2$ + $BaCl_2.2H_2O$ | 69.91 | 16.90 | | |
| C | $BaCl_2.2H_2O$ | 65.90 | | | |
| | | 49.10 | | 22.58 | |
| | | 27.90 | | 54.14 | |
| D | $BaCl_2.2H_2O$ + NaCl | 9.07 | | 101.75 | |
| E | NaCl | | | 110.80 | |
| | | | | 83.26 | 84.98 |
| F | NaCl + $NaNO_3$ | | | 71.40 | 132.46 |
| G | $NaNO_3$ | | | 62.56 | 140.56 |
| | | | | | 204.58 |
| H | $NaNO_3$ + $Ba(NO_3)_2$ | | 5.76 | | 206.12 |
| | $Ba(NO_3)_2$ | | 5.18 | | 67.76 |
| | | | 5.93 | | 37.18 |
| | | | 8.30 | | 17.22 |
| | $Ba(NO_3)_2$ + $BaCl_2.2H_2O$ | 37.29 | 15.09 | 42.92 | |
| | | 17.11 | 15.41 | 80.70 | |
| P | $Ba(NO_3)_2$ + $BaCl_2.2H_2O$ + NaCl | 0.31 | 17.68 | 112.37 | |
| | $NaNO_3$ + $Ba(NO_3)_2$ | | 4.76 | 36.17 | 160.00 |
| | | | 4.34 | 66.78 | 141.04 |
| Q | $NaNO_3$ + $Ba(NO_3)_2$ + NaCl | | 4.19 | 70.60 | 131.49 |
| | NaCl + $NaNO_3$ | | 2.82 | 70.55 | 131.17 |
| | $t$ = 20°C (126) | | | | |
| | $Ba(NO_3)_2$ | | 5.92 | | 13.13 |
| | | | 4.14 | | 37.26 |
| | | | 4.68 | | 128.98 |
| | $Ba(NO_3)_2$ + $NaNO_3$ | | 2.63 | | 184.86 |
| | $NaNO_3$ | | | 42.82 | 142.77 |
| | | | | 52.95 | 132.76 |

**$Cl^-$ $NO_3^-$ $Ba^{++}$ $Na^+$.—(*Continued*)**

| Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|
| | 0.5Ba-$Cl_2$ | 0.5Ba-$(NO_3)_2$ | NaCl | $NaNO_3$ |
| *t* = 20°C.—(*Continued*) | | | | |
| $NaNO_3$ + NaCl | | | 76.06 | 115.02 |
| NaCl | | | 87.01 | 73.51 |
| | | | 90.52 | 62.70 |
| | 3.90 | | 106.53 | |
| NaCl + $BaCl_2.2H_2O$ | 7.26 | | 104.65 | |
| | 9.66 | | 87.63 | |
| | 15.01 | | 76.06 | |
| $BaCl_2.2H_2O$ | 23.00 | | 59.17 | |
| | 16.92 | | 31.89 | |
| | 62.05 | 24.85 | | |
| $BaCl_2.2H_2O$ + $Ba(NO_3)_2$ | 63.78 | 14.04 | | |
| | 49.51 | 12.40 | | |
| $Ba(NO_3)_2$ | 26.27 | 11.43 | | |
| | 15.22 | 11.57 | | |
| $NaNO_3$ + $Ba(NO_3)_2$ | 4.13 | | 37.47 | 148.45 |
| NaCl + $Ba(NO_3)_2$ | 0.32 | | 81.03 | 84.99 |
| $BaCl_2.2H_2O$ + $Ba(NO_3)_2$ | 56.89 | 13.00 | 9.04 | |
| $Ba(NO_3)_2$ + NaCl + $NaNO_3$ | | 0.32 | 78.39 | 112.72 |
| NaCl + $Ba(NO_3)_2$ + $BaCl_2.2H_2O$ | | 14.42 | 109.08 | 1.55 |

**$Cl^-$ $NO_3^-$ $Ba^{++}$ $Na^+$**
$H_2O$ + $BaCl_2$ + $NaNO_3$
*t* = 30°C (86)

| Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|
| | 0.5Ba-$Cl_2$ | 0.5Ba-$(NO_3)_2$ | NaCl | $NaNO_3$ |
| $Ba(NO_3)_2$ | | 15.88 | | |
| $Ba(NO_3)_2$ + $NaNO_3$ | | 4.36 | 66.84 | 141.16 |
| | | 4.76 | 36.20 | 156.16 |
| $NaNO_3$ | | | | 204.90 |
| $NaNO_3$ + NaCl | | 2.82 | 70.74 | 131.20 |
| $BaCl_2.2H_2O$ + $Ba(NO_3)_2$ | 37.28 | 15.18 | 42.92 | |
| | 17.21 | 15.41 | 80.92 | |
| NaCl + $BaCl_2.2H_2O$ + $Ba(NO_3)_2$ | 27.18 | 20.48 | 103.16 | |
| NaCl + $Ba(NO_3)_2$ + $NaNO_3$ | | 4.33 | 70.70 | 131.52 |

**$Cl^-$ $NO_3^-$ $Na^+$ (38, 88, 126, 307)**
$H_2O$ + NaCl + $NaNO_3$

| Solid phases | Liquid phase—* = g per 100g $H_2O$; † = % NaCl; % $NaNO_3$ | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *t* = 5°C (307) | | *t* = 15.5°C (38) | | *t* = 20°C (126) | | *t* = 25°C (307) | | *t* = 30°C (88) | | *t* = 50°C (307) | | *t* = 100°C (307) | |
| | NaCl* | $NaNO_3$* | NaCl† | $NaNO_3$† | NaCl† | $NaNO_3$† | NaCl* | $NaNO_3$* | NaCl† | $NaNO_3$† | NaCl* | $NaNO_3$* | NaCl* | $NaNO_3$* |
| NaCl | 35.74 | | 26.43 | | | | 36.04 | | 26.47 | | 36.72 | | 39.2 | |
| | | | 20.91 | 10.52 | 18.45 | 18.62 | 35.07 | 5.0 | 16.14 | 24.17 | 28.40 | 43.9 | | |
| | | | 17.04 | 21.52 | 17.34 | 21.30 | 33.90 | 10.0 | 13.11 | 32.02 | | | | |
| | | | | | | | 32.87 | 15.0 | | | | | | |
| NaCl + $NaNO_3$ | 27.60 | 41.70 | 14.37 | 28.25 | 13.80 | 30.34 | 23.62 | 58.01 | 12.48 | 33.67 | 20.50 | 84.8 | 19.20 | 158 |
| $NaNO_3$ | 19.42 | 50.10 | 11.36 | 31.61 | 9.56 | 34.85 | 15.00 | 70.69 | 10.89 | 35.77 | | 114.1 | | 176 |
| | | 76.30 | 5.34 | 38.34 | 7.67 | 37.18 | 10.00 | 77.46 | 4.05 | 43.39 | | | | |
| | | | 2.93 | 41.59 | | | 5.00 | 84.67 | 0 | 49.16 | | | | |
| | | | 0 | 45.47 | | | | 91.86 | | | | | | |

**$Cl^-$ $NO_3^-$ $Na^+$ $K^+$ (307)**
$H_2O$ + $NaNO_3$ + KCl; *v.* Fig. 30

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *t* = 5°C | | | | *t* = 25°C | | | | *t* = 50°C | | | | *t* = 100°C | | | |
| | | NaCl | KCl | $NaNO_3$ | $KNO_3$ | NaCl | KCl | $NaNO_3$ | $KNO_3$ | NaCl | KCl | $NaNO_3$ | $KNO_3$ | NaCl | KCl | $NaNO_3$ | $KNO_3$ |
| A | $KNO_3$ | | | | 30.0 | | | | 68.3 | | | | 151.5 | | | | 438 |
| B | $KNO_3$ + KCl | | 72.27 | | 18.07 | | 84.4 | | 40.6 | | 93.6 | | 93.6 | | 100 | | 354.5 |
| C | KCl | | 71.9 | | | | 86.9 | | | | 103.4 | | | | 135.5 | | |
| D | KCl + NaCl | 97.0 | 25.3 | | | 91.4 | 39.7 | | | 87.3 | 55.3 | | | 84.1 | 87.5 | | |
| E | NaCl | 110.0 | | | | 111.0 | | | | 113.0 | | | | 120.6 | | | |
| F | NaCl + $NaNO_3$ | 85.0 | | 88.3 | | 72.7 | | 122.9 | | 63.12 | | 179.6 | | 59.2 | | 334.6 | |
| G | $NaNO_3$ | | | 161.6 | | | | 194.6 | | | | 241.5 | | | | 373.1 | |
| H | $NaNO_3$ + $KNO_3$ | | | 173.9 | 32.3 | | | 213.6 | 82.3 | | | 285.7 | 160.7 | | | 495.6 | 389.4 |
| P | $NaNO_3$ + $KNO_3$ + NaCl | 89.58 | | 93.75 | 25.0 | 73.4 | | 135.5 | 73.4 | 37.7 | | 234.3 | 146.4 | 20.16 | | 439.4 | 346.8 |
| Q | KCl + NaCl + $KNO_3$ | 118.6 | 1.54 | | 36.86 | 127.7 | | | 71.9 | 184.5 | | 12.91 | 126.3 | 110.5 | 113.5 | | 342.6 |

**$Cl^- NO_3^- K^+$**

$H_2O + KCl + KNO_3$

$t = 17.50°C$ (38)

| % KCl | % $KNO_3$ |
|---|---|
| KCl | |
| 25.06 | 0 |
| 22.95 | 5.49 |
| 22.59 | 7.30 |
| 21.65 | 10.19 |
| KCl + $KNO_3$ | |
| 21.02 | 12.28 |
| $KNO_3$ | |
| 20.13 | 13.54 |
| 18.07 | 13.95 |
| 16.13 | 14.54 |
| 12.64 | 15.82 |
| 10.28 | 17.00 |
| 6.58 | 19.07 |
| 4.03 | 20.84 |
| 0 | 23.81 |

g per 100g $H_2O$ (307)

$t = 5°C$

| KCl | $KNO_3$ |
|---|---|
| KCl | |
| 29.76 | 0.0 |
| 16.32 | 11.40 |
| KCl + $KNO_3$ | |
| 29.87 | 10.14 |
| NaCl | |
| 0.0 | 16.83 |

$t = 25°C$

| KCl | |
|---|---|
| 35.98 | 0 |
| 35.80 | 5 |
| 35.54 | 10 |
| 35.12 | 15 |
| KCl + $KNO_3$ | |
| 34.92 | 22.79 |
| NaCl | |
| 15 | 28.93 |

**$Cl^- NO_3^- K^+$.**—(*Continued*)

g per 100g $H_2O$ (307)

| KCl | $KNO_3$ |
|---|---|
| NaCl | |
| 10 | 31.49 |
| 5 | 34.89 |
| 0 | 38.85 |

$t = 50°C$

| KCl | |
|---|---|
| 42.80 | |
| 41.39 | 24.05 |
| KCl + $KNO_3$ | |
| 38.75 | 52.54 |
| NaCl | |
| 0.0 | 85.10 |

$t = 100°C$

| KCl | |
|---|---|
| 56.0 | |
| KCl + $KNO_3$ | |
| 41.6 | 199.0 |
| NaCl | |
| 0.0 | 246 |

g per 100g $H_2O$ (14)

$t = 0°C$

| KCl | $KNO_3$ |
|---|---|
| KCl | |
| 28.355 | 0.0 |
| 28.425 | 2.5276 |
| 28.360 | 5.0553 |
| 28.760 | 10.1103 |

$t = 25°C$

| KCl | |
|---|---|
| 36.415 | 0.0 |
| 36.500 | 2.5276 |
| 36.165 | 5.0552 |
| 35.880 | 10.1103 |
| $KNO_3$ | |
| 35.520 | 15.165 |
| 7.4553 | 32.485 |
| 0.0 | 38.448 |

**$Cl^- NO_3^- K^+$.**—(*Continued*)

$t = 25°C$ (19)

| % KCl | % $KNO_3$ |
|---|---|
| KCl | |
| 27.20 | 0.0 |
| 23.43 | 11.63 |
| KCl + $KNO_3$ | |
| 21.90 | 16.65 |
| $KNO_3$ | |
| 10.48 | 22.00 |
| 0.0 | 31.40 |

**$Cl^- NH_4^+$** (14)

$H_2O + HCl + NH_4Cl$

g per 100g $H_2O$

$t = 0°C$

| HCl | $NH_4Cl$ |
|---|---|
| $NH_4Cl$ | |
| 0.0 | 29.84 |
| 0.9116 | 28.643 |
| 1.8233 | 27.123 |
| 3.6468 | 24.535 |

$t = 25°C$

| $NH_4Cl$ | |
|---|---|
| 0.0 | 39.51 |
| 0.9116 | 38.085 |
| 1.8233 | 36.600 |
| 3.6465 | 33.905 |

**$Cl^- NH_4^+ AsO_2^-$**

$H_2O + NH_4Cl + As_2O_3$

$t = 30°C$ (352)

| % $NH_4Cl$ | % $As_2O_3$ |
|---|---|
| $As_2O_3$ | |
| 0.0 | 2.26 |
| 3.86 | 2.29 |
| $As_2O_3 + NH_4Cl.As_2O_3$ | |
| 7.08 | 2.28 |
| $NH_4Cl.As_2O_3$ | |
| 9.08 | 1.31 |
| 11.76 | 0.993 |

**$Cl^- NH_4^+ AsO_2^-$.**—(*Cont'd*)

| % $NH_4Cl$ | % $As_2O_3$ |
|---|---|
| $NH_4Cl.As_2O_3$ | |
| 21.09 | 0.490 |
| 24.61 | 0.432 |
| 27.18 | 0.398 |
| $NH_4Cl.As_2O_3 + NH_4Cl$ | |
| 29.52 | 0.291 |
| $NH_4Cl$ | |
| 29.30 | 0.0 |

**$Cl^- NH_4^+ CO_3^{--}$** (273)

$H_2O + NH_4Cl + (NH_4)_2CO_3$

$t = 0°C$

| % $(NH_4)_2CO_3$ | % $NH_4Cl$ |
|---|---|
| $(NH_4)_2CO_3$ | |
| 35.82 | 0.0 |
| $(NH_4)_2CO_3 + NH_4Cl$ | |
| 30.90 | 14.42 |
| $NH_4Cl$ | |
| 9.27 | 19.40 |
| 0.0 | 22.90 |

$t = 15°C$

| $(NH_4)_2CO_3$ | |
|---|---|
| 38.27 | 0.0 |
| $(NH_4)_2CO_3 + NH_4Cl$ | |
| 31.72 | 16.27 |
| $NH_4Cl$ | |
| 11.79 | 21.23 |
| 0.0 | 26.09 |

**$Cl^- NH_4^+ C_2O_4^{--}$** (82)

$H_2O + NH_4Cl + (NH_4)_2C_2O_4$

| °C | % $NH_4Cl$ | % $(NH_4)_2C_2O_4$ |
|---|---|---|
| $NH_4Cl + (NH_4)_2C_2O_4.H_2O$ | | |
| 15 | 26.35 | 0.14 |
| 50 | 32.55 | 0.67 |

**$Cl^- NH_4^+ CO_3^{--} Na^+$** (273): $H_2O + NH_4Cl + Na_2CO_3$; *v.* Fig. 31

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $t = 0°C$ | | | | $t = 15°C$; *v.* Fig. 31 | | | |
| | | NaCl | $NH_4Cl$ | $0.5Na_2CO_3$ | $0.5(NH_4)_2CO_3$ | NaCl | $NH_4Cl$ | $0.5Na_2CO_3$ | $0.5(NH_4)_2CO_3$ |
| A | $NH_4Cl$ | | 100.0 | | | | 118.8 | | |
| | | 26.5 | 82.5 | | | 48.3 | 85.8 | | |
| | $NH_4Cl + NaCl$ | 86.11 | 52.8 | | | 76.0 | 68.3 | | |
| C | NaCl | 109.6 | | | | 109.9 | | | |
| D | $NaCl + Na_2CO_3.\frac{5}{2}H_2O$ | 106.2 | | 14.9 | | 89.6 | | 46.5 | |
| E | $Na_2CO_3.\frac{5}{2}H_2O + Na_2CO_3.10H_2O$ | 93.26 | | 19.36 | | 69.8 | | 48.5 | |
| | $Na_2CO_3.10H_2O$ | 38.5 | | 30.6 | | 55.4 | | 45.5 | |
| F | | | | 48.2 | | | | 56.0 | |
| G | $Na_2CO_3.10H_2O + Na_2CO_3.\frac{5}{2}H_2O$ | | | 41.43 | 67.5 | | | 62.2 | 70.1 |
| | $Na_2CO_3.\frac{5}{2}H_2O$ | | | 23.43 | 1.87 | | | 55.4 | 103.5 |
| H | $Na_2CO_3.\frac{5}{2}H_2O + (NH_4)_2CO_3$ | | | 61.13 | 240.2 | | | 54.0 | 244.5 |
| | | | | | 209.3 | | | 14.6 | 222.0 |
| | $(NH_4)_2CO_3$ | | | | | | | | 232.5 |
| I | | | | | | | 34 | | 230.0 |
| | | | | | | | 48.8 | | 229.5 |
| J | | | 88.9 | | 212.6 | | 105.4 | | 228.7 |
| | $(NH_4)_2CO_3 + NH_4Cl$ | 48.50 | 52.5 | | 295.5 | 80.4 | 77.8 | | 276 |
| | | 14.1 | 74.7 | | 235.8 | 18.0 | 90.6 | | 226.3 |
| | $Na_2CO_3.\frac{5}{2}H_2O + (NH_4)_2CO_3$ | 24.4 | | 28.9 | 244.0 | 85.3 | 23.3 | | 364.7 |
| P | $NH_4Cl + (NH_4)_2CO_3 + Na_2CO_3.\frac{5}{2}H_2O$ | 72.0 | 42.7 | | 340.0 | 144.8 | 50.6 | | 343.2 |
| | $NH_4Cl + Na_2CO_3.H_2O$ | 75.9 | 34.2 | | 75.8 | 99.4 | 43.7 | | 99.3 |

$Cl^-$ $NH_4^+$ $CO_3^{--}$ $Na^+$.—*(Continued)*

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 0°C | | | | $t$ = 15°C; *v.* Fig. 31 | | | |
| | | NaCl | $NH_4Cl$ | $0.5Na_2CO_3$ | $0.5(NH_4)_2CO_3$ | NaCl | $NH_4Cl$ | $0.5Na_2CO_3$ | $0.5(NH_4)_2CO_3$ |
| Q | $NH_4Cl + NaCl + Na_2CO_3.\frac{5}{2}H_2O$ | 91.6 | 25.7 | | 83.3 | 106.4 | 46.9 | | 61.2 |
| | $NH_4Cl + NaCl$ | 86.1 | 50.9 | | 14.0 | 73.6 | 67.5 | | 4.8 |
| | $NaCl + Na_2CO_3.\frac{5}{2}H_2O$ | 107.1 | | 7.16 | 18.0 | 104.1 | 14.2 | | 46.0 |
| X | $Na_2CO_3.\frac{5}{2}H_2O + Na_2CO_3.10H_2O$ | | | | | | 29.76 | | 39.46 |

In the work at 15°C (273) no examination of the solid phases found was made. In the later article the writer states that both $Na_2CO_3.\frac{5}{2}H_2O$ and $Na_2CO_3.10H_2O$ were present as solid phases at both 0° and 15° and reports the points E, G, and X separating the $Na_2CO_3.\frac{5}{2}H_2O$ from the $Na_2CO_3.10H_2O$ field.

$Cl^-$ $NH_4^+$ $HCO_3^-$ $Na^+$ (122, 384): $H_2O + NH_4HCO_3 + NaCl$; *v.* Fig. 32

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 0°C (122); *v.* Fig. 32 | | | | $t$ = 15°C (122); *v.* Fig. 32 | | | | $t$ = 15°C (384) | | | | $t$ = 30°C (122); *v.* Fig. 32 | | | |
| | | $NH_4HCO_3$ | $NH_4Cl$ | $NaHCO_3$ | NaCl | $NH_4HCO_3$ | $NH_4Cl$ | $NaHCO_3$ | NaCl | $NH_4HCO_3$ | $NH_4Cl$ | $NaHCO_3$ | NaCl | $NH_4HCO_3$ | $NH_4Cl$ | $NaHCO_3$ | NaCl |
| A | $NaHCO_3$ | | | 14.8 | | | | 18.9 | | | | 20.5 | | | | 23.6 | |
| B | $NaHCO_3 + NaCl$ | | | 1.6 | 108.0 | | | 2.2 | 109.1 | | | 2.23 | 109.3 | | | 3.1 | 110.2 |
| C | $NaCl$ | | | | 109.6 | | | | 110.2 | | | | 110.2 | | | | 110.9 |
| D | $NaCl + NH_4Cl$ | | 49.1 | | 88.0 | | 67.0 | | 81.9 | | 63.4 | | 83.5 | | 85.9 | | 76.7 |
| E | $NH_4Cl$ | | 100.3 | | | | 119.5 | | | | 117.8 | | | | 140.2 | | |
| F | $NH_4Cl + NH_4HCO_3$ | 8.3 | 97.6 | | | 14.6 | 115.2 | | | 15.6 | 114.5 | | | 20.7 | 133.2 | | |
| G | $NH_4HCO_3$ | 21.96 | | | | 42.5 | | | | 42.44 | | | | 61.6 | | | |
| H | $NH_4HCO_3 + NaHCO_3$ | 25.0 | | 10.4 | | 38.9 | | 12.8 | | 45.0 | | 13.45 | | 52.4 | | 14.9 | |
| P | $NaHCO_3 + NH_4HCO_3 + NH_4Cl$ | | 88.56 | 10.62 | 17.28 | | 113.04 | 16.74 | 9.18 | | 110 | 18.50 | 12.8 | | | | |
| Q | $NaHCO_3 + NaCl + NH_4Cl$ | | 49.32 | 2.16 | 86.94 | | 67.14 | 3.24 | 79.92 | | 70.1 | 4.51 | 77.72 | | | | |

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 35°C (384) | | | | $t$ = 45°C (122); *v.* Fig. 32 | | | | $t$ = 50°C (384) | | | |
| | | $NH_4HCO_3$ | $NH_4Cl$ | $NaHCO_3$ | NaCl | $NH_4HCO_3$ | $NH_4Cl$ | $NaHCO_3$ | NaCl | $NH_4HCO_3$ | $NH_4Cl$ | $NaHCO_3$ | NaCl |
| A | $NaHCO_3$ | | | 25.5 | | | | 29.7 | | | | 31.17 | |
| B | $NaHCO_3 + NaCl$ | | | 4.8 | 115.6 | | | 4.1 | 111.2 | | | 5.85 | 111.2 |
| C | $NaCl$ | | | | 111.4 | | | | 112.3 | | | | 112.9 |
| D | $NaCl + NH_4Cl$ | | 91.7 | | 74.9 | | 108.4 | | 72.0 | | 116.0 | | 71.1 |
| E | $NH_4Cl$ | | 146.7 | | | | 162.5 | | | | 169.5 | | |
| F | $NH_4Cl + NH_4HCO_3$ | 23.9 | 146.8 | | | | | | | 29.64 | 166.4 | | |
| G | $NH_4HCO_3$ | 70.37 | | | | | | | | 101.8 | | | |
| H | $NH_4HCO_3 + NaHCO_3$ | 64.4 | | 16.09 | | | | | | 94.7 | | 19.00 | |
| P | $NaHCO_3 + NH_4HCO_3 + NH_4Cl$ | 29.6 | 120.2 | | 24.38 | | | | | 15.33 | 179.6 | 24.0 | |
| Q | $NaHCO_3 + NaCl + NH_4Cl$ | | 91.85 | 6.8 | 71.44 | | | | | | 133.1 | 10.24 | 61.44 |

$Cl^-$ $NH_4^+$ $Zn^{++}$ (258)
$H_2O + NH_4Cl + ZnCl_2$; *v.* Fig. 33

| | Solid phases | Liquid phase | | | | | |
|---|---|---|---|---|---|---|---|
| | | $t$ = 0°C | | $t$ = 20°C | | $t$ = 30°C | |
| | | % $NH_4Cl$ | % $ZnCl_2$ | % $NH_4Cl$ | % $ZnCl_2$ | % $NH_4Cl$ | % $ZnCl_2$ |
| A | $NH_4Cl$ | 22.80 | | 26.9 | | 29.50 | |
| B | $NH_4Cl + 3NH_4Cl.ZnCl_2$ | 26.30 | 25.70 | 29.50 | 26.00 | 30.75 | 26.35 |
| C | $3NH_4Cl.ZnCl_2 + 2NH_4Cl.2ZnCl_2$ | 24.60 | 42.60 | 26.00 | 43.20 | 27.30 | 43.80 |
| D | $2NH_4Cl.ZnCl_2$ | 6.80 | 62.10 | 14.50 | 53.20 | 17.60 | 51.20 |
| E | $2NH_4Cl.ZnCl_2 + ZnCl_2$ | | | 7.90 | 66.60 | 9.25 | 66.95 |
| F | $ZnCl_2$ | | | | | 3.20 | 78.50 |

$Cl^-$ $NH_4^+$ $Pb^{++}$: $H_2O + NH_4Cl + PbCl_2$; $t$ = 22°C (46)

| M per 1000g $H_2O$ | | | |
|---|---|---|---|
| $NH_4Cl$ | $0.5PbCl_2$ | $NH_4Cl$ | $0.5PbCl_2$ |
| $PbCl_2$ | | $NH_4Cl.PbCl_2$ | |
| 0 | 0.0749 | 0.7 | 0.0099 |
| 0.1 | 0.0325 | 0.8 | 0.0087 |
| 0.2 | 0.0194 | 0.9 | 0.0083 |
| 0.3 | 0.0153 | 1.0 | 0.0080 |
| 0.4 | 0.0138 | 1.2 | 0.0075 |
| 0.5 | 0.0130 | 1.5 | 0.0073 |
| 0.55 | 0.0123 | 2.0 | 0.0077 |
| $NH_4Cl.PbCl_2$ | | 2.5 | 0.0092 |
| 0.6 | 0.0113 | 3.0 | 0.0112 |
| 0.65 | 0.0105 | 4.0 | 0.0182 |

$Cl^-$ $NH_4^+$ $Pb^{++}$.—(*Continued*)

| M per 1000g $H_2O$ | | | |
|---|---|---|---|
| $NH_4Cl$ | $0.5PbCl_2$ | $NH_4Cl$ | $0.5PbCl_2$ |
| $NH_4Cl.PbCl_2$ | | $NH_4Cl.PbCl_2 + NH_4Cl$ | |
| 5.0 | 0.0296 | 7.29 | 0.0898 |
| 6.0 | 0.0473 | $NH_4Cl$ | |
| 7.0 | 0.0774 | 7.29 | 0.0000 |

$Cl^-$ $NH_4^+$ $Hg^{++}$

$H_2O + NH_4Cl + HgCl_2$

$t = 30°C$ (261); *v.* Fig. 34

| | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % $NH_4Cl$ | % $HgCl_2$ |
| A | $NH_4Cl$ | 29.50 | |
| B | $NH_4Cl + 2NH_4Cl.HgCl_2.H_2O$ | 24.79 | 50.05 |
| C | $2NH_4Cl.HgCl_2.H_2O + NH_4Cl.HgCl_2.H_2O$ | 20.02 | 58.90 |
| D | $NH_4Cl.HgCl_2.H_2O + 2NH_4Cl.3HgCl_2.H_2O$ | 14.10 | 57.04 |
| E | $2NH_4Cl.3HgCl_2.H_2O + 2NH_4Cl.9HgCl_2$ | 9.20 | 58.65 |
| F | $2NH_4Cl.9HgCl_2 + HgCl_2$ | 3.62 | 29.65 |
| G | $HgCl_2$ | | 7.67 |

$Cl^-$ $NH_4^+$ $Hg^{++}$ $K^+$

$H_2O + NH_4Cl + HgCl_2 + KCl$; *v.* Figs. 35, 36

$t = 25°C$ (290)

1. Composition of liquid phase and of solid solutions IA, IB, and II in equilibrium at 25°C. Solid solution IA contains from 0–13% $K_2Cl_2$; IB, 70–100%; II varies continuously from $HgCl_2.(NH_4)_2Cl_2.H_2O$ to $HgCl_2.K_2Cl_2.H_2O$; *v.* Fig. 35.

| | Liquid phase in moles | | | | Solid phases in moles—solid solutions | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | IA | IB | II | | |
| | $HgCl_2$ | $(NH_4)_2Cl_2$ | $K_2Cl_2$ | $H_2O$ | $(NH_4)_2Cl_2$ | $K_2Cl_2$ | $HgCl_2$ | $(NH_4)_2Cl_2$ | $K_2Cl_2$ |
| A | 43.35 | 56.65 | | 377 | | | | | |
| | 40.88 | 55.93 | 3.91 | 462 | 99.9 | 0.1 | 50 | 37.8 | 12.2 |
| | 38.60 | 53.05 | 8.35 | 506 | 99.9 | 0.1 | 50 | 34.2 | 15.8 |
| | 33.59 | 53.65 | 12.76 | 605 | 99.0 | 1.0 | 50 | 24.2 | 25.8 |
| | 32.73 | 52.34 | 14.93 | 620 | 99.1 | 0.9 | 50 | 22.3 | 27.7 |
| | 31.95 | 51.87 | 16.18 | 662 | 98.9 | 1.10 | 50 | 21.0 | 29.0 |
| B | 30.04 | 51.26 | 18.70 | 660 | 87.0 | 13.0 | 50 | 18.9 | 31.10 |
| | 30.24 | 51.31 | 18.45 | 665 | 30.0 | 70.0 | 50 | 18.1 | 31.9 |
| | 29.52 | 48.00 | 22.48 | 730 | 17.20 | 82.8 | 50 | 15.0 | 35.0 |
| | 28.88 | 43.10 | 28.02 | 854 | 12.0 | 88.0 | 50 | 8.9 | 41.1 |
| | 28.37 | 36.94 | 34.69 | 880 | 9.0 | 91.0 | 50 | 7.1 | 42.9 |
| | 26.29 | 27.92 | 45.79 | 1037 | 4.7 | 95.3 | 50 | 5.4 | 44.6 |
| | 25.30 | 19.24 | 55.46 | 1160 | 2.6 | 97.4 | 50 | 2.6 | 47.4 |
| | 24.60 | 11.50 | 63.90 | 1276 | 2.5 | 97.5 | 50 | 1.1 | 48.9 |
| C | 23.45 | | 76.55 | 1408 | | | | | |

2. Composition of liquid phase at 25°C, expressed in moles, in equilibrium with solid solution II and solid solution III. Solid solution II varies continuously from $HgCl_2.(NH_4)_2Cl_2.H_2O$ to $HgCl_2.K_2Cl_2.H_2O$; solid solution III from 2 $HgCl_2.K_2Cl_2.2H_2O$ to $2HgCl_2.(NH_4)_2Cl_2.2H_2O$; *v.* Fig. 35.

| | Liquid phase in moles | | | |
|---|---|---|---|---|
| | $HgCl_2$ | $(NH_4)_2Cl_2$ | $K_2Cl_2$ | $H_2O$ |
| D | 51.37 | 48.63 | | 312 |
| | 49.65 | 45.79 | 4.56 | 409 |
| | 48.65 | 40.47 | 11.07 | 506 |
| | 47.10 | 34.22 | 18.68 | 641 |
| | 45.56 | 26.95 | 27.49 | 778 |
| | 42.48 | 7.20 | 50.32 | 1107 |
| E | 42.34 | | 57.66 | 1218 |

3. Composition of liquid phase at 25°C, expressed in moles, in equilibrium with solid $HgCl_2$ and solid $9HgCl_2.(NH_4)_2Cl_2$; *v.* Fig. 36.

| | Liquid phase in moles | | | |
|---|---|---|---|---|
| | $HgCl_2$ | $(NH_4)_2Cl_2$ | $K_2Cl_2$ | $H_2O$ |
| A | 79.43 | 20.57 | | 6338 |
| | 79.02 | 19.44 | 1.54 | 6073 |
| | 78.42 | 17.58 | 4.00 | 5787 |
| | 78.11 | 16.82 | 5.07 | 5607 |
| | 77.56 | 15.14 | 7.30 | 5119 |
| | 77.03 | 12.50 | 10.47 | 4712 |
| | 76.46 | 10.40 | 13.14 | 4022 |
| | 75.64 | 7.68 | 16.68 | 3512 |
| | 75.19 | 5.80 | 19.01 | 3000 |
| B | 74.88 | 5.45 | 19.67 | 2899 |

4. Composition, expressed in moles, at 25°C of system solid $HgCl_2$, solid solution IV (points D-E of Fig. 36), and a liquid phase (points B-C of Fig. 36). Solid solution IV varies continuously from $4HgCl_2.K_2Cl_2.4H_2O$ to a mixture containing 6.3% $(NH_4)_2Cl_2$ in place of $K_2Cl_2$.

| Liquid phase | | | | Solid soln. IV | | | |
|---|---|---|---|---|---|---|---|
| $HgCl_2$ | $(NH_4)_2Cl_2$ | $K_2Cl_2$ | $H_2O$ | $HgCl_2$ | $(NH_4)_2Cl_2$ | $K_2Cl_2$ | $H_2O$ |
| 74.74 | | 25.26 | 3149 | 80 | | 20 | 80 |
| 75.02 | 3.50 | 21.48 | 3061 | 80 | 1.7 | 18.3 | 80 |
| 74.84 | 4.11 | 21.05 | 3065 | 80 | 2.4 | 17.6 | 80 |
| 74.29 | 8.84 | 16.87 | 2708 | 80 | 6.0 | 14.0 | 80 |
| 73.69 | 11.84 | 14.48 | 2499 | 80 | 6.3 | 12.7 | 80 |

5. Composition, expressed in moles, at 25°C of system solid $9HgCl_2.(NH_4)_2Cl_2$, solid solution IV and a liquid phase (points B-F of Fig. 36).

| Liquid phase | | | | Solid soln. IV | | | |
|---|---|---|---|---|---|---|---|
| $HgCl_2$ | $(NH_4)_2Cl_2$ | $K_2Cl_2$ | $H_2O$ | $HgCl_2$ | $(NH_4)_2Cl_2$ | $K_2Cl_2$ | $H_2O$ |
| 72.90 | 12.56 | 14.54 | 2554 | 80 | 5.6 | 14.4 | 80 |
| 71.41 | 15.53 | 13.06 | 2313 | 80 | 6.5 | 13.5 | 80 |

6. Composition of liquid phase (points F-G of Fig. 36), expressed in moles, at 25°C in equilibrium with solid solution IV and solid solution V. Solid solution V consists of varying proportions of $3HgCl_2.(NH_4)_2Cl_2.H_2O$ and $3HgCl_2.K_2Cl_2.H_2O$. It was not possible to determine the composition of either of the solid phases in equilibrium with the four solutions whose composition is given below.

| Liquid phase | | | |
|---|---|---|---|
| $HgCl_2$ | $(NH_4)_2Cl_2$ | $K_2Cl_2$ | $H_2O$ |
| 70.15 | 17.20 | 12.65 | 2067 |
| 69.82 | 14.89 | 15.29 | 2245 |
| 69.07 | 11.25 | 19.68 | 2416 |
| 68.58 | 7.69 | 23.73 | 2507 |

7. Composition of liquid phase (points I-J of Fig. 36), expressed in moles, at 25°C in equilibrium with solid solution V and solid solution VI. Solid solution VI consists of $2HgCl_2.(NH_4)_2Cl_2.H_2O$ and $2HgCl_2.K_2Cl_2.H_2O$. It was not possible to determine the composition of either of the solid phases in equilibrium with the ten solutions whose composition is given below.

| Liquid phase | | | |
|---|---|---|---|
| $HgCl_2$ | $(NH_4)_2Cl_2$ | $K_2Cl_2$ | $H_2O$ |
| 61.65 | 38.35 | | 594 |
| 61.40 | 37.52 | 1.08 | 562 |
| 61.35 | 37.44 | 1.21 | 626 |
| 60.70 | 35.33 | 3.97 | 750 |
| 60.64 | 32.59 | 6.77 | 966 |
| 60.87 | 27.64 | 11.49 | 1358 |

**$Cl^-$ $NH_4^+$ $Hg^{++}$ $K^+$.—(*Continued*)**

Liquid phase.—(*Continued*)

| $HgCl_2$ | $(NH_4)_2Cl_2$ | $K_2Cl_2$ | $H_2O$ |
|---|---|---|---|
| 61.21 | 25.22 | 13.57 | 1533 |
| 61.44 | 23.24 | 15.32 | 1647 |
| 61.82 | 20.53 | 17.65 | 1832 |
| 63.72 | 14.45 | 21.83 | 2175 |
| 65.90 | 7.71 | 26.39 | 2475 |

8. Composition of liquid phase (points J-K of Fig. 36), expressed in moles, at 25°C in equilibrium with solid solution IV and solid solution VI. It was not possible to determine the composition of either of the solid phases in equilibrium with the two solutions whose composition is given below.

Liquid phase

| $HgCl_2$ | $(NH_4)_2Cl_2$ | $K_2Cl_2$ | $H_2O$ |
|---|---|---|---|
| 67.64 | | 32.36 | 2729 |
| 68.08 | 2.42 | 29.50 | 2644 |

9. Composition of liquid phase (points L-G of Fig. 36), expressed in moles at 25°C in equilibrium with solid $9HgCl_2.(NH_4)_2Cl_2$ and solid solution V.

Liquid phase

| $HgCl_2$ | $(NH_4)_2Cl_2$ | $K_2Cl_2$ | $H_2O$ |
|---|---|---|---|
| 68.60 | 31.40 | | 965 |

**$Cl^-$ $NH_4^+$ $Cu^{++}$ (133, 259, 312)**

$H_2O + NH_4Cl + CuCl_2$; *v.* Fig. 37

| | Solid phases | Liquid phase $t$ = 0.2°C (312) % $NH_4Cl$ | % $CuCl_2$ | $t$ = 25°C (312) % $NH_4Cl$ | % $CuCl_2$ | $t$ = 30°C (259) % $NH_4Cl$ | % $CuCl_2$ |
|---|---|---|---|---|---|---|---|
| A | $NH_4Cl$ | | | 28.10 | | 29.5 | |
| B | $NH_4Cl$ and solid soln. I* | 22.28 | 1.62 | 27.69 | 1.78 | 28.60 | 1.90 |
| | | 7.49 | 15.09 | 10.94 | 16.35 | 19.80 | 7.70 |
| C | Solid soln. I* | | | | | 12.10 | 15.60 |
| | | | | | | 4.9 | 29.40 |
| D | Solid soln. I* and $CuCl_2.2H_2O$ | 0.75 | 40.80 | 1.79 | 43.30 | 2.0 | 43.20 |
| E | $CuCl_2.2H_2O$ | | 41.00 | | 43.40 | | 43.90 |

* Solid soln. I, found by (312) at 0.2 and 25°C, varies but slightly from the composition $CuCl_2.2NH_4Cl.2H_2O$ found in these solid phases by (259).

$t$ = 25°C (133)

| % $NH_4Cl$ | % $CuCl_2$ | % $NH_4Cl$ | % $CuCl_2$ |
|---|---|---|---|
| Solid soln.* | | Solid soln.* + $2NH_4Cl.CuCl_2.2H_2O$ | |
| 28.13 | 1.08 | | |
| 27.90 | 1.35 | 27.72 | 1.83 |
| 27.83 | 1.66 | | |

* Solid soln. = $NH_4Cl + CuCl_2$.

**$Cl^-$ $NH_4^+$ $Cu^{++}$ $Ba^{++}$**

$H_2O + NH_4Cl + CuCl_2 + BaCl_2$; *v.* Fig. 38

$t$ = 30°C (338)

| | Solid phases | Liquid phase % $NH_4Cl$ | % $BaCl_2$ | % $CuCl_2$ |
|---|---|---|---|---|
| A | $NH_4Cl$ | 29.50 | | |
| B | $NH_4Cl + BaCl_2.2H_2O$ | 25.83 | 7.97 | |
| C | $BaCl_2.2H_2O$ | | 27.60 | |
| D | $BaCl_2.2H_2O + CuCl_2.2H_2O$ | | 2.71 | 42.34 |
| E | $CuCl_2.2H_2O$ | | | 43.95 |
| F | $CuCl_2.2H_2O + 2NH_4Cl.CuCl_2.2H_2O$ | 2.03 | | 43.20 |
| G | $2NH_4Cl.CuCl_2.2H_2O + NH_4Cl$ | 28.60 | | 1.90 |
| P | $NH_4Cl + 2NH_4Cl.CuCl_2.2H_2O +$ $BaCl_2.2H_2O$ | 25.17 | 7.30 | 1.73 |
| Q | $2NH_4Cl.CuCl_2.2H_2O + BaCl_2.2H_2O + CuCl_2.2H_2O$ | 2.12 | 2.38 | 41.58 |

**$Cl^-$ $NH_4^+$ $Cu^{++}$ $K^+$**

$H_2O + NH_4Cl + CuCl_2 + KCl$

$t$ = 17°C (128)

| M % $2KCl.CuCl_2.2H_2O$* | |
|---|---|
| In solid phases | In satd. soln. |
| Solid soln. I | |
| 8.25 | 17.06 |
| 8.33 | 17.42 |
| 9.63 | 18.85 |
| 7.69 | 20.69 |
| 8.70 | 23.20 |
| 9.07 | 23.90 |
| 9.92 | 24.48 |
| 11.56 | 25.88 |
| 13.88 | 30.95 |
| 16.04 | 31.31 |
| 13.60 | 31.96 |
| 14.86 | 34.58 |
| 15.02 | 35.90 |
| 17.36 | 38.09 |
| 19.01 | 41.49 |
| 23.61 | 44.10 |
| 24.47 | 48.36 |
| 26.37 | 50.67 |
| 27.77 | 73.52 |
| Solid soln. II | |
| 54.87 | 74.24 |
| 53.29 | 75.33 |
| 58.80 | 78.54 |
| 76.74 | 89.50 |

* The author (128) shows that two isomorphous salts, $2NH_4Cl.CuCl_2.2H_2O$ and $2KCl.CuCl_2.2H_2O$ form two series of mixed crystals at 17°C. One contains up to 27.77M % of the potassium double salt; the other from 54.87 to 76.74M %.

**$Cl^-$ $NH_4^+$ $Ag^+$**

$H_2O + NH_4OH + AgCl$

$t$ = 25°C (370)

| % AgCl | % $NH_3$ |
|---|---|
| AgCl | |
| 0.326 | 0.736 |
| 1.640 | 2.766 |
| 4.770 | 5.760 |
| 7.034 | 7.429 |
| 7.656 | 7.965 |
| $AgCl + 2AgCl.3NH_3$ | |
| 8.907 | 8.773 |
| $2AgCl.3NH_3$ | |
| 9.091 | 9.082 |
| 10.476 | 14.954 |
| 10.825 | 15.832 |
| 10.670 | 17.655 |

**$Cl^-$ $NH_4^+$ $IrCl_6^{--}$**

$H_2O + NH_4Cl + (NH_4)_2IrCl_6$

$t$ = 20°C (13)

| $M_{NH_4Cl}$/l | g $(NH_4)_2IrCl_6$/l |
|---|---|
| $(NH_4)_2IrCl_6$ | |
| 2.0 | 0.027 |
| 1.0 | 0.64 |
| 0.2 | 0.78 |
| 0.1 | 1.793 |

**$Cl^-$ $NH_4^+$ $PtCl_6^{--}$**

$H_2O + NH_4Cl + (NH_4)_2PtCl_6$

$t$ = 20°C (13)

| $M_{NH_4Cl}$/l | g $(NH_4)_2PtCl_6$/l |
|---|---|
| $(NH_4)_2PtCl_6$ | |
| 2.0 | 0.024 |
| 1.0 | 0.028 |
| 0.2 | 0.186 |
| 0.1 | 0.423 |

**$Cl^-$ $NH_4^+$ $Mn^{++}$ (77, 138)**

$H_2O + NH_4Cl + MnCl_2$; *v.* Figs. 39, 40

| | Solid phases | Liquid phase $t$ = 25°C % $NH_4Cl$ | % $MnCl_2$ | $t$ = 60°C % $NH_4Cl$ | % $MnCl_2$ |
|---|---|---|---|---|---|
| A | | 28.33 | | 33.52 | 2.91 |
| | Solid soln. A* | 25.11 | 5.37 | 31.93 | 5.84 |
| | | 22.35 | 10.70 | 29.50 | 10.16 |
| | | 20.30 | 14.62 | | |
| B | Solid soln. A + Solid soln. B | 19.48 | 16.04 | 27.81 | 12.95 |
| | | 18.37 | 17.54 | 27.07 | 13.79 |
| | | 16.90 | 19.39 | 25.28 | 15.91 |
| | | 15.41 | 21.42 | 22.51 | 18.86 |
| | Solid soln. B | 14.26 | 23.02 | 19.04 | 22.42 |
| | | 12.69 | 24.83 | 14.33 | 27.74 |
| | | 8.56 | 30.16 | 10.52 | 32.80 |
| | | 5.53 | 35.42 | 5.44 | 43.10 |
| | | 4.86 | 37.02 | 3.93 | 47.20 |
| | | 3.85 | 39.53 | 2.94 | 49.33 |
| C | Solid soln. B + Solid soln. C | 2.95 | 43.22 | 2.45 | 50.22 |
| | | 2.26 | 43.28 | 2.21 | 50.68 |
| | Solid soln. C | 1.31 | 43.31 | 1.61 | 51.16 |
| | | | 43.45 | 0.91 | 51.47 |

* The authors (78) show that the percentages of $NH_4Cl$ in the A-B series of

solid solutions, which are simultaneously in equilibrium with a liquid phase containing the proper proportions of $NH_4Cl$ and $MnCl_2$, differ when the temperatures concerned vary from 70 to 24°C, but that they become identical at slightly below 25°C, as shown in Fig. 40. Richards [309] shows that $MnCl_2.4H_2O$ and $MnCl_2.2H_2O$ are in equilibrium with the saturated solution at 58.098°C.

### $Cl^-$ $NH_4^+$ $Fe^{++}$

$H_2O + NH_4Cl + FeCl_2$

$t = 70°C$ [75]; *v.* Fig. 41

| | % $NH_4Cl$ | % $FeCl_2$ | | % $NH_4Cl$ | % $FeCl_2$ |
|---|---|---|---|---|---|
| | Solid soln. I* | | | Solid soln. II | |
| A | 31.39 | 9.52 | D | 2.69 | 46.42 |
| B | 18.61 | 26.56 | | $FeCl_2.4H_2O$ | |
| | Solid soln. I + Solid soln. II† | | E | 1.64 | 46.61 |
| C | 6.76 | 41.18 | | 0 | 46.90 |

* Solid soln. I ($NH_4Cl$, $FeCl_2.2H_2O$) contains from 100 to *ca.* 28 % $NH_4Cl$.

† Solid soln. II ($NH_4Cl$, $FeCl_2.2H_2O$) contains from *ca.* 26.5 to *ca.* 8 % $NH_4Cl$.

### $Cl^-$ $NH_4^+$ $Fe^{+++}$ [76]

$H_2O + NH_4Cl + FeCl_3$; *v.* Figs. 42, 43

| | Solid phases | Liquid phase: $t$ = 25°C (Fig. 42) % $NH_4Cl$ | % $FeCl_3$ | $t$ = 60°C (Fig. 43) % $NH_4Cl$ | % $FeCl_3$ |
|---|---|---|---|---|---|
| A | $NH_4Cl$ | 28.10 | 0 | 36.00 | 0 |
| B | Solid soln. I + Solid soln. II | 16.63 | 30.45 | 24.73 | 25.78 |
| C | Solid soln. II + $NH_4Cl.FeCl_3$ | | | 9.50 | 65.30 |
| D | $NH_4Cl.FeCl_3$ + $NH_4Cl.4FeCl_3.6H_2O$ | | | 1.36 | 75.84 |
| E | $NH_4Cl.4FeCl_3.6H_2O$ + $FeCl_3.2H_2O$ | | | 0.18 | 78.20 |
| F | $FeCl_3.2H_2O$ | | | 0 | 78.42 |
| G | Solid soln. II + $FeCl_3.6H_2O$ | 2.29 | 49.50 | | |
| H | $FeCl_3.6H_2O$ | 0 | 49.60 | | |

### $Cl^-$ $NH_4^+$ $Co^{++}$ [75, 133]: $H_2O + NH_4Cl + CoCl_2$

| | $t$ = 60°C [75]; *v.* Fig. 44 % $NH_4Cl$ | % $CoCl_2$ | $t$ = 25°C [133] % $NH_4Cl$ | % $CoCl_2$ |
|---|---|---|---|---|
| | Solid soln. I | | Solid soln. I† | |
| A | 29.10 | 10.11 | 17.9 | 15.63 |
| B | 17.74m* | 31.24m* | 13.59 | 25.19 |
| C | 13.08m* | 37.05m* | 8.75 | 34.28 |
| D | 11.71 | 38.96 | Solid soln. I + $CoCl_2.6H_2O$ | |
| E | 10.36 | 40.14 | 7.54 | 34.93 |
| F | 0.9 | 48.62 | | |
| G | 16.87 | 30.94 | | |
| H | 11.80 | 37.01 | | |

* The stable system consists of a second series of solid solutions, whose composition, as shown in Fig. 44, varies but little.

† Solid soln. I = $NH_4Cl + CoCl_2.2H_2O$.

### $Cl^-$ $NH_4^+$ $Ni^{++}$ [75, 133]: $H_2O + NH_4Cl + NiCl_2$

| | $t$ = 70°C [75]; *v.* Fig. 45 % $NH_4Cl$ | % $NiCl_2$ | $t$ = 25°C [133] % $NH_4Cl$ | % $NiCl_2$ |
|---|---|---|---|---|
| | Solid soln. A* | | Solid soln.‡ | |
| A | 30.92 | 8.59 | 26.07 | 3.10 |
| B | 18.37 | 30.03 | 22.27 | 8.04 |
| | | | 20.68 | 10.32 |
| | Solid soln. B† | | 17.43 | 15.01 |
| C | 17.54 | 30.69 | 11.22 | 26.93 |
| D | 5.35 | 43.87 | 9.90 | 32.82 |
| | $NiCl_2.2H_2O$ | | 9.16 | 35.70 |
| | | | Solid soln.‡ + $NiCl_2.6H_2O$ | |
| E | 2.79 | 44.99 | 8.15 | 37.56 |
| F | 0.0 | 45.80 | $NiCl_2.6H_2O$ | |
| | | | 7.51 | 37.19 |
| | | | 3.06 | 37.98 |
| | | | 0 | 37.53 |

* Solid soln. A ($NH_4Cl$, $NiCl_2.2H_2O$) contains from 100 to 68.8 % $NH_4Cl$.

† Solid soln. B ($NH_4Cl$, $NiCl_2.2H_2O$) contains from 62.5 to 21.8 % $NH_4Cl$.

‡ $NH_4Cl + NiCl_2.2H_2O$.

### $Cl^-$ $NH_4^+$ $B_4O_7^{--}$

$H_2O + NH_4Cl + (NH_4)_2B_4O_7$ [329]

| Solid phases | Liquid phase: $t$ = 0°C % $NH_4Cl$ | % $(NH_4)_2B_4O_7$ | $t$ = 10°C % $NH_4Cl$ | % $(NH_4)_2B_4O_7$ | $t$ = 25°C % $NH_4Cl$ | % $(NH_4)_2B_4O_7$ |
|---|---|---|---|---|---|---|
| $NH_4Cl$ | 22.82 | | 25.01 | | 28.28 | |
| $NH_4Cl$ + $(NH_4)_2B_4O_7.4H_2O$ | 22.14 | 1.77 | 24.42 | 1.98 | 27.11 | 3.83 |
| $(NH_4)_2B_4O_7.4H_2O$ | | 3.76 | | 5.26 | | 8.99 |

### $Cl^-$ $NH_4^+$ $B_4O_7^{--}$ $Na^+$; *v.* p. 297

### $Cl^-$ $NH_4^+$ $Mg^{++}$ [34]

$H_2O + NH_4Cl + MgCl_2$; *v.* Fig. 47

| | Solid phases | Liquid phase: $t$ = 3.5°C % $NH_4Cl$ | % $MgCl_2$ | $t$ = 25°C % $NH_4Cl$ | % $MgCl_2$ | $t$ = 50°C % $NH_4Cl$ | % $MgCl_2$ |
|---|---|---|---|---|---|---|---|
| A | $NH_4Cl$ | 23.81 | | 27.79 | | 33.16 | |
| B | $NH_4Cl$ + $NH_4Cl.MgCl_2.6H_2O$ | 5.93 | 21.41 | 8.78 | 20.95 | 12.46 | 20.84 |
| C | $NH_4Cl.MgCl_2.6H_2O$ + $MgCl_2.6H_2O$ | 0.09 | 34.43 | 0.09 | 35.41 | 0.15 | 36.92 |
| D | $MgCl_2.6H_2O$ | | 34.48 | | 35.59 | | 36.97 |

### $Cl^-$ $NH_4^+$ $Mg^{++}$ $K^+$

$H_2O + NH_4Cl + MgCl_2 + KCl$

$t$ = 25°C [34]

| % $NH_4Cl$ | % $MgCl_2.6H_2O$ | % KCl |
|---|---|---|
| Solid soln. I* | | |
| 0.12 | 61.06 | 1.52 |
| 0.14 | 59.78 | 2.10 |
| 0.27 | 58.52 | 2.48 |
| 0.33 | 57.80 | 2.74 |
| Solid soln. II† | | |
| 0.42 | 57.37 | 2.86 |
| 0.44 | 57.50 | 2.72 |
| Solid soln. III‡ | | |
| 0.59 | 56.84 | 2.67 |
| 0.47 | 59.03 | 2.10 |
| 0.73 | 55.57 | 3.09 |
| 1.83 | 50.51 | 4.45 |
| 2.48 | 50.90 | 3.46 |
| 3.35 | 47.55 | 4.49 |
| 5.81 | 47.57 | 1.42 |

* Solid soln. I contains from 0 to 15M % $NH_4Cl.MgCl_2.6H_2O$ and from 100 to 85 % $KCl.MgCl_2.6H_2O$. Forms rhombic pseudo-hexagonal crystals.

† Solid soln. II contains from 15 to 27M % $NH_4Cl.MgCl_2.6H_2O$. The crystals show inclined extinction and are probably monoclinic.

‡ Solid soln. III contains from 27 to 100M % $NH_4Cl.MgCl_2.6H_2O$. The crystals are rhombic pseudo-tetragonal.

### $Cl^-$ $NH_4^+$ $Ba^{++}$ [338, 341.5]

$H_2O + NH_4Cl + BaCl_2$

| °C [341.5] | % $NH_4Cl$ | % $BaCl_2$ |
|---|---|---|
| | $NH_4Cl + BaCl_2.2H_2O$ | |
| −16.2 | 16.10 | 8.07 |
| 0 | 19.26 | 8.22 |
| +30 | 24.89 | 8.19 |
| 40 | 26.93 | 8.40 |
| 50 | 29.53 | 8.55 |
| | $t$ = 30°C [338] | |
| | $NH_4Cl$ | |
| | 29.5 | 0.0 |
| | 27.47 | 3.56 |
| | $NH_4Cl + BaCl_2.2H_2O$ | |
| | 25.93 | 7.97 |
| | $BaCl_2.2H_2O$ | |
| | 24.69 | 8.33 |
| | 20.00 | 10.89 |
| | 13.84 | 15.42 |
| | 10.06 | 18.36 |
| | 5.71 | 22.16 |
| | 0.0 | 27.60 |

### $Cl^-$ $NH_4^+$ $Na^+$

$H_2O + NH_4OH + NaCl$

$t$ = 30°C [171]; *v. also* p. 297

| % $NH_3$ | %NaCl |
|---|---|
| | NaCl |
| 2.516 | 25.00 |
| 3.488 | 25.09 |
| 4.074 | 24.97 |
| 5.288 | 24.93 |
| 6.318 | 24.84 |
| 6.381 | 24.84 |
| 7.243 | 24.55 |
| 8.700 | 24.14 |

### $Cl^- NH_4^+ B_4O_7^{--} Na^+$ (329)

$H_2O + NH_4Cl + Na_2B_4O_7$; *v.* Fig. 46

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 0°C | | | | $t$ = 10°C | | | | $t$ = 25°C (*v.* Fig. 46) | | | |
| | | $NH_4Cl$ | $0.5(NH_4)_2B_4O_7$ | $NaCl$ | $0.5Na_2B_4O_7$ | $NH_4Cl$ | $0.5(NH_4)_2B_4O_7$ | $NaCl$ | $0.5Na_2B_4O_7$ | $NH_4Cl$ | $0.5(NH_4)_2B_4O_7$ | $NaCl$ | $0.5Na_2B_4O_7$ |
| A | $(NH_4)_2B_4O_7.4H_2O$ | | 7.32 | | | | 10.41 | | | | 18.58 | | |
| B | $(NH_4)_2B_4O_7.4H_2O + NH_4Cl$ | 97.92 | 4.35 | | | 111.66 | 5.06 | | | 132.10 | 10.40 | | |
| C | $NH_4Cl$ | 99.52 | | | | 112.22 | | | | 132.70 | | | |
| D | $NH_4Cl + NaCl$ | 49.00 | | 85.76 | | 60.71 | | 81.18 | | 81.14 | | 77.35 | |
| E | $NaCl$ | | | 109.34 | | | | 109.99 | | | | 110.64 | |
| F | $NaCl + Na_2B_4O_7.10H_2O$ | | | 108.06 | 0.85 | | | 109.22 | 0.97 | | | 109.53 | 1.80 |
| G | $Na_2B_4O_7.10H_2O$ | | | | 1.98 | | | | 2.90 | | | | 5.69 |
| H | $Na_2B_4O_7.10H_2O + (NH_4)_2B_4O_7.4H_2O$ | | 6.38 | | 1.52 | | 9.79 | | 2.35 | | 19.96 | | 6.26 |
| | $Na_2B_4O_7.10H_2O + NaCl + NH_4Cl$ | 49.33 | | 85.79 | 1.58 | | | | | | | | |
| | $Na_2B_4O_7.10H_2O + NH_4Cl$ | 58.71 | | 69.14 | 1.92 | | | | | | | | |
| | | 68.87 | | 48.82 | 1.97 | | | | | | | | |
| | | 74.10 | | 40.57 | 2.92 | | | | | | | | |
| P | $NaCl + NH_4Cl + Na_2B_4O_7.10H_2O$ | | | | | 61.38 | | 80.33 | 2.34 | 85.16 | | 71.49 | 9.80 |
| | $NH_4Cl + Na_2B_4O_7.10H_2O$ | | | | | 76.50 | | 51.42 | 3.99 | 97.99 | | 50.00 | 13.0 |
| | | | | | | 91.50 | | 30.14 | 5.00 | | | | |
| Q | $NH_4Cl + Na_2B_4O_7.10H_2O + (NH_4)_2B_4O_7.4H_2O$ | 87.14 | | 21.22 | 3.77 | 95.05 | | 25.98 | 6.30 | 105.52 | | 38.32 | 14.83 |
| | $Na_2B_4O_7.10H_2O + (NH_4)_2B_4O_7.4H_2O$ | 74.98 | | 17.06 | 3.57 | 73.94 | | 18.09 | 5.71 | 93.90 | | 32.0 | 13.90 |
| | | 48.71 | | 10.84 | 3.22 | 58.70 | | 12.35 | 4.79 | 78.9 | | 25.0 | 12.80 |
| | $Na_2B_4O_7.10H_2O + NaCl$ | | | | | 39.20 | | 91.52 | 2.25 | | | | |
| | $(NH_4)_2B_4O_7.4H_2O + NH_4Cl$ | | | | | 112.7 | | 0.03 | 4.41 | | | | |

### $Cl^- NH_4^+ Na^+$ (311, 329)

$H_2O + NH_4Cl + NaCl$

| Solid phases | Liquid phase | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C(311) | | $t$ = 0°C(329) | | $t$ = 10°C(329) | | $t$ = 25°C(329) | | $t$ = 25°C(311) | | $t$ = 40°C(311) | | $t$ = 60°C(311) | | $t$ = 80°C(311) | |
| | % $NH_4Cl$ | % $NaCl$ | % $NH_4Cl$ | % $NaCl$ | % $NH_4Cl$ | % $NaCl$ | % $NH_4Cl$ | % $NaCl$ | % $NH_4Cl$ | % $NaCl$ | % $NH_4Cl$ | % $NaCl$ | % $NH_4Cl$ | % $NaCl$ | % $NH_4Cl$ | % $NaCl$ |
| $NH_4Cl$ | 22.9 | 0 | 22.82 | | 25.01 | | 28.28 | | 28.2 | 0 | 31.4 | 0 | 35.6 | 0 | 39.6 | 0 |
| | 15.3 | 11.1 | | | | | | | 21.5 | 8.9 | | | | | | |
| $NH_4Cl + NaCl$ | 10.2 | 19.9 | 10.22 | 19.57 | 12.49 | 18.26 | 16.16 | 16.82 | 15.9 | 17.10 | 19.4 | 15.5 | 24.4 | 15.7 | 29.5 | 12.0 |
| $NaCl$ | 0 | 26.3 | | 26.20 | | 26.32 | | 26.43 | 0 | 26.4 | 0 | 26.7 | 0 | 27.0 | 0 | 27.5 |

### $Cl^- NH_4^+ K^+$ (387)

$H_2O + NH_4Cl + KCl$; *v.* Fig. 48

L = g $NH_4Cl$/100g of dissolved salt; S = g $NH_4Cl$/100g of solid

| | Solid phases | Liquid phase | | | | | |
|---|---|---|---|---|---|---|---|
| | | $t$ = 25°C | | $t$ = 65°C | | $t$ = 90°C | |
| | | L | S | L | S | L | S |
| A | Solid soln. I* | 10.4 | 0.0 | 11.6 | 0.0 | 23.7 | 2.7 |
| B | | 26.9 | 0.0 | 25.0 | 1.6 | 31.0 | 6.0 |
| C | | 49.7 | 4.5 | 42.8 | 8.1 | 39.0 | 9.0 |
| D | | 64.3 | 14.0 | 54.2 | 14.2 | 46.5 | 12.4 |
| | | 66.1 | 17.0 | 69.3 | 29.9 | 68.3 | 35.6 |
| | | | | 70.7 | 33.7 | 73.8 | 48.1 |
| E | Solid soln. I* + Solid soln. II† | 67.4 | 23.5 | 72.0 | 48.1 | 77.8 | 75.1 |
| | | 69.6 | 94.7 | 72.2 | 73.4 | 77.8 | 79.0 |

* Solid soln. I at 25°C = 0–21 % $NH_4Cl$; at 65°C = 0–38 % $NH_4Cl$; at 90°C = 0–62 % $NH_4Cl$.

† Solid soln. II at 25°C = 93–100 % $NH_4Cl$; at 65°C = 90–100 % $NH_4Cl$, at 90°C = 87–100 % $NH_4Cl$.

### $Cl^- NH_4^+ K^+$.—(*Continued*)

| Solid phases | Liquid phase | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 25°C | | $t$ = 65°C | | $t$ = 90°C | |
| | L | S | L | S | L | S |
| Solid soln. II† | 73.2 | 96.3 | 76.5 | 95.5 | 80.6 | 92.9 |
| | 84.2 | 100.0 | 79.4 | 98.4 | 86.1 | 98.8 |
| | | | 88.1 | 100.0 | 88.8 | 100.0 |

$t$ = 25°C (34)

| % $NH_4Cl$ | % KCl | % $NH_4Cl$ | % KCl |
|---|---|---|---|
| Solid soln. I‡ | | Solid soln. I‡ | |
| 5.13 | 22.29 | 22.04 | 10.49 |
| 7.0 | 20.40 | 21.68 | 10.40 |
| 11.0 | 18.04 | Solid soln. I‡ + Solid soln. II§ | |
| 13.73 | 16.11 | 21.95 | 10.48 |
| 15.46 | 14.53 | Solid soln. II§ | |
| 19.54 | 12.16 | 24.30 | 6.48 |

‡ Solid soln. I contains from 0 to 15.12 % $NH_4Cl$.

§ Solid soln. II contains from 79.32 to 100 % $NH_4Cl$.

### $Cl^- HPO_4^{--} Na^+$ (99, 269, 286)

$H_2O + NaCl + Na_2HPO_4$; *v.* Fig. 49

| | °C | Solid phases | Liquid phase: % $Na_2HPO_4$ | Liquid phase: % NaCl |
|---|---|---|---|---|
| A | −21.2 | $NaCl.2H_2O$ + Ice | | 22.42 |
| B | +15.0 | $NaCl.2H_2O$ | | |
| C | 100 | NaCl | | 28.15 |
| D | − 0.9 | $Na_2HPO_4.12H_2O$ + Ice | 1.87 | |
| E | +35.4 | $Na_2HPO_4.12H_2O$ + $Na_2HPO_4.7H_2O$ | 31.55 | |
| F | 48.35 | $Na_2HPO_4.7H_2O$ + $Na_2HPO_4.2H_2O$ | 44.10 | |
| G | 95.2 | $Na_2HPO_4.2H_2O$ + $Na_2HPO_4$ | 51.69 | |
| H | 99.77 | $Na_2HPO_4$ | 50.68 | |
| I | −23.0 | $NaCl.2H_2O$ + $Na_2HPO_4.12H_2O$ + Ice | 0.64 | 22.04 |
| J | − 1.8 | $NaCl.2H_2O$ + NaCl + $Na_2HPO_4.12H_2O$ | 1.22 | 25.52 |
| K | +19.52 | NaCl + $Na_2HPO_4.12H_2O$ + $Na_2HPO_4.7H_2O$ | 4.74 | 23.59 |
| L | 39.30 | NaCl + $Na_2HPO_4.7H_2O$ + $Na_2HPO_4.2H_2O$ | 20.09 | 15.80 |
| M | 79.50 | NaCl + $Na_2HPO_4.2H_2O$ + $Na_2HPO_4$ | 24.22 | 15.31 |

### $Cl^- AsO_2^- Ca^{++}$

$H_2O + As_2O_3 + CaCl_2$

$t$ = 19.5 20°C (354)

| % $As_2O_3$ | % $CaCl_2$ |
|---|---|
| $As_2O_3$ | |
| 1.78 | 0.0 |
| 1.39 | 12.66 |
| 1.01 | 23.09 |
| 0.865 | 27.68 |
| 0.697 | 36.01 |
| $As_2O_3$ + $CaCl_2.6H_2O$ | |
| 0.675 | 41.92 |
| $CaCl_2.6H_2O$ | |
| 0.0 | 42.70* |

### $Cl^- AsO_2^- Sr^{++}$

$H_2O + As_2O_3 + SrCl_2$

$t$ = 30°C (354)

| % $As_2O_3$ | % $SrCl_2$ |
|---|---|
| $As_2O_3$ | |
| 2.26 | 0 |
| 2.14 | 6.27 |
| 1.92 | 13.67 |
| 1.67 | 21.29 |
| 1.46 | 27.46 |
| 1.28 | 34.03 |
| $As_2O_3$ + $SrCl_2.6H_2O$ | |
| 1.23 | 36.16 |
| $SrCl_2.6H_2O$ | |
| 0 | 37.60* |

### $Cl^- AsO_2^- Ba^{++}$

$H_2O + As_2O_3 + BaCl_2$

$t$ = 30°C (354)

| % $As_2O_3$ | % $BaCl_2$ |
|---|---|
| $As_2O_3$ | |
| 2.26 | 0 |
| 2.24 | 3.84 |
| 2.20 | 8.72 |
| 2.19 | 8.86 |
| 2.15 | 10.34 |
| $(As_2O_3)_2.BaCl_2$ | |
| 1.69 | 9.55 |

* By interpolation from earlier work.

### $Cl^- AsO_2^- Ba^{++}$.—(*Continued*)

| % $As_2O_3$ | % $BaCl_2$ |
|---|---|
| $(As_2O_3)_2.BaCl_2$ | |
| 1.12 | 13.62 |
| 0.905 | 16.93 |
| 0.737 | 20.06 |
| 0.608 | 23.87 |
| $(As_2O_3)_2.BaCl_2$ + $BaCl_2.2H_2O$ | |
| 0.506 | 26.54 |
| $BaCl_2.2H_2O$ | |
| 0 | 27.60* |

### $Cl^- AsO_2^- Li^+$

$H_2O + As_2O_3 + LiCl$

$t$ = 30°C (353)

| % $As_2O_3$ | % LiCl |
|---|---|
| $As_2O_3$ | |
| 2.26 | 0.0 |
| 1.69 | 7.57 |
| 1.15 | 15.30 |
| 0.77 | 22.67 |
| 0.54 | 29.04 |
| 0.43 | 35.37 |
| 0.377 | 41.55 |
| $As_2O_3$ + $LiCl.H_2O$ | |
| 0.410 | 45.12 |
| $LiCl.H_2O$ | |
| 0.0 | 46.10* |

### $Cl^- AsO_2^- Na^+$

$H_2O + As_2O_3 + NaCl$

$t$ = 30°C (352)

| % $As_2O_3$ | % NaCl |
|---|---|
| $As_2O_3$ | |
| 2.26 | 0.0 |
| 2.18 | 5.93 |
| 2.04 | 11.49 |
| 1.88 | 16.86 |
| 1.71 | 22.06 |
| $As_2O_3$ + NaCl | |
| 1.58 | 26.16 |
| NaCl | |
| 0.0 | 26.50 |

### $Cl^- AsO_2^- K^+$

$H_2O + As_2O_3 + KCl$

$t$ = 30°C (352)

| % $As_2O_3$ | % KCl |
|---|---|
| $As_2O_3$ | |
| 2.26 | 0.0 |
| 2.40 | 6.58 |
| 2.46 | 10.37 |
| $6As_2O_3.5KCl$ | |
| 2.10 | 11.22 |
| 1.77 | 13.59 |
| 1.52 | 15.89 |
| 1.34 | 17.72 |
| 1.10 | 20.67 |
| 0.995 | 22.38 |
| 0.898 | 22.92 |
| 0.841 | 25.23 |
| $6As_2O_3.5KCl$ + KCl | |
| 0.780* | 27.04* |
| KCl | |
| 0.0 | 27.20 |

* Average value.

### $Cl^- Sb^{+++}$ (33)

$H_2O + HCl + Sb_2O_3$

$t$ = 15°C

M per 1000M $H_2O$

| $SbCl_3$ | HCl |
|---|---|
| $Sb_4O_5Cl_2$ | |
| 0.009 | 4.20 |
| 0.015 | 4.60 |
| 0.029 | 20.00 |
| 0.167 | 27.60 |
| SbOCl | |
| 0.8 | 36.6 |
| 2.70 | 44.0 |
| 8.90 | 47.8 |
| 25.60 | 48.5 |
| 47.50 | 52.0 |
| 66.80 | 52.4 |
| $t$ = 20°C | |
| $SbCl_3$ | |
| 724 | |
| 712 | 24 |
| 699 | 61 |
| 685 | 82.5 |
| 689 | 91 |
| 681 | 117 |
| 628 | 287 |
| SbOCl | |
| 197 | 84.5 |
| 217 | 74 |
| 250 | 88 |
| $(SbOCl)_x.(SbCl_3)_y$ | |
| 358 | 79 |
| 440 | 68 |
| 637 | 62 |
| 698 | 53 |
| $SbCl_3$ + $(SbOCl)_x.(SbCl_3)_y$ | |
| 688 | 39.5 |
| $t$ = 50°C | |
| $Sb_4O_5Cl_2$ | |
| 0.008 | 1.80 |
| 0.08 | 15.80 |
| 0.012 | 20.00 |
| 0.460 | 27.6 |

### $Cl^- Bi^{+++}$

$H_2O + HCl + Bi(OH)_3$

$t$ = 25°C (284)

M per 1000g $H_2O$

| $BiCl_3$ | HCl |
|---|---|
| BiOCl(?) | |
| 0.0013 | 0.3438 |
| 0.00396 | 0.4295 |
| 0.00869 | 0.4960 |
| 0.01323 | 0.5399 |
| 0.01856 | 0.5742 |
| 0.03138 | 0.6434 |
| 0.05338 | 0.7223 |
| 0.08937 | 0.8079 |
| 0.1324 | 0.8752 |
| 0.1810 | 0.9891 |
| 0.2050 | 1.020 |
| 0.2657 | 1.105 |
| 0.5685 | 1.481 |
| 0.8324 | 1.758 |
| 1.100 | 2.025 |
| 1.317 | 2.115 |

Herz and Bulla (180) give experimental data on the hydrolysis of $BiCl_3$ at 25°C. They obtained values ranging from 0.021 to 0.033 for the constant $(BiCl_3) \div (HCl)^2$.

### $Cl^- CO_3^{--} HCO_3^- Co^{++} K^+$

$H_2O + CoCl_2 + K_2CO_3 + KHCO_3$

$t$ = 18°C (7)

| g $K_2CO_3$/l | g $KHCO_3$/l |
|---|---|
| $CoCO_3.K_2CO_3.4H_2O$ + $KHCO_3$ | |
| 13.3 | 280.6 |
| 25.5 | 272.4 |
| 103.2 | 237.0 |
| 125.1 | 227.6 |
| 166.8 | 203.2 |
| 289.4 | 158.9 |
| 453.5 | 108.4 |
| 607.7 | 68.9 |
| 704.3 | 54.6 |
| $CoCO_3.K_2CO_3.4H_2O$ + $KHCO_3$ + $K_2CO_3.2KHCO_3.3H_2O$ | |
| 800.2 | 43.1 |
| $CoCO_3.K_2CO_3.4H_2O$ + $K_2CO_3.2KHCO_3.3H_2O$ | |
| 805.1 | 40.9 |
| 822.8 | 35.0 |
| $CoCO_3.K_2CO_3.4H_2O$ + $K_2CO_3.2KHCO_3.3H_2O$ + $K_2CO_3.2H_2O$ | |
| 825.8 | 33.10 |
| $CoCO_3.K_2CO_3.4H_2O$ + $K_2CO_3.2H_2O$ | |
| 836.2 | 12.26 |
| 840.8 | 5.9 |

**$Cl^-$ $CO_3^{--}$ $HCO_3^-$ $Na^+$ (141)**: $H_2O$ + NaCl + $Na_2CO_3$ + $NaHCO_3$; *v.* Fig. 50

| | $t$ = 0°C | | | $t$ = 15°C | | | $t$ = 20°C | | |
|---|---|---|---|---|---|---|---|---|---|
| | % $Na_2CO_3$ | % $NaHCO_3$ | % NaCl | % $Na_2CO_3$ | % $NaHCO_3$ | % NaCl | % $Na_2CO_3$ | % $NaHCO_3$ | % NaCl |
| | | | | $NaHCO_3$ | | | | | |
| | | 6.5 | | | 8.1 | | | 8.7 | |
| | | | | $NaHCO_3$ + $Na_2CO_3.10H_2O$ | | | | | |
| | 5.6 | 4.6 | | 13.3 | 4.3 | | 17.05 | 4.0 | |
| | | | | $Na_2CO_3.10H_2O$ | | | | | |
| | 6.6 | | | 14.1 | | | 17.6 | | |
| | | | | $Na_2CO_3.10H_2O$ + NaCl | | | | | |
| | 2.8 | | 24.2 | 9.2 | | 20.2 | 13.5 | | 17.4 |
| | | | | NaCl | | | | | |
| | | | 26.3 | | | 26.3 | | | 26.4 |
| | | | | NaCl + $NaHCO_3$ | | | | | |
| | | 0.6 | 25.9 | | 0.9 | 26.1 | | 1.0 | 26.1 |
| | | | | $NaHCO_3$ + $Na_2CO_3.10H_2O$ | | | | | |
| | 3.78 | 3.51 | 4.81 | 11.42 | 4.05 | 3.06 | | | |
| | 2.89 | 2.83 | 9.53 | 9.62 | 2.33 | 7.71 | | | |
| | 2.39 | 2.14 | 15.14 | | | | | | |
| | 2.63 | 0.92 | 21.32 | | | | | | |
| | | | | $NaHCO_3$ + $Na_2CO_3.10H_2O$ + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| | 2.77 | 1.11 | 22.84 | 9.74 | 1.41 | 11.19 | 16.17 | 3.40 | 2.22 |
| | | | | NaCl + $Na_2CO_3.10H_2O$ + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| | 2.99 | 0.73 | 23.86 | 9.11 | 0.19 | 20.49 | 13.4 | 0.61 | 17.54 |
| | | | | $NaHCO_3$ + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| | | | | 4.80 | 1.91 | 18.52 | 14.6 | 3.51 | 3.87 |
| | | | | | | | 12.7 | 3.09 | 6.03 |
| | | | | | | | 11.52 | 2.86 | 7.64 |
| | | | | | | | 6.99 | 2.83 | 13.43 |
| | | | | $NaHCO_3$ + NaCl + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| | 2.75* | 0.94* | 23.87* | 3.25 | 0.61 | 23.93 | 2.60 | 1.53 | 23.74 |
| | | | | $NaHCO_3$ + NaCl | | | | | |
| | 1.30 | 0.73 | 25.05 | | | | | | |
| | | | | $Na_2CO_3.10H_2O$ + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| | | | | 8.48 | 1.38 | 15.24 | 13.40 | 2.60 | 7.90 |
| | | | | | | | 12.58 | 1.07 | 13.97 |
| | | | | NaCl + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| | | | | 6.41 | 0.08 | 22.18 | 8.48 | 0.69 | 20.50 |
| | | | | 4.70 | 0.31 | 23.22 | 5.35 | 0.84 | 22.38 |

* Average of two results.

| | $t$ = 25°C; *v.* Fig. 50 | | | $t$ = 30°C | | | $t$ = 35°C | | |
|---|---|---|---|---|---|---|---|---|---|
| | % $Na_2CO_3$ | % $NaHCO_3$ | % NaCl | % $Na_2CO_3$ | % $NaHCO_3$ | % NaCl | % $Na_2CO_3$ | % $NaHCO_3$ | % NaCl |
| | | | | $NaHCO_3$ | | | | | |
| A | | 9.3 | | | 9.9 | | | 10.6 | |
| | | | | $NaHCO_3$ + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| B | 17.9 | 4.05 | | 17.6 | 4.03 | | 17.3 | 4.7 | |
| | | | | $Na_2CO_3.10H_2O$ + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| C | 22.6 | 1.5 | | 27.4 | 1.3 | | | | |
| | | | | $Na_2CO_3.10H_2O$ | | | | | |
| D | 22.7 | | | 28.45 | | | | | |
| | | | | $Na_2CO_3.7H_2O$ | | | | | |
| | | | | | | | 32.9 | | |
| | | | | $Na_2CO_3.10H_2O$ + $Na_2CO_3.7H_2O$ | | | | | |
| E | 19.0 | | 11.8 | 26.0 | | 3.9 | | | |
| | | | | $Na_2CO_3.7H_2O$ + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| | | | | | | | 32.5 | 0.6 | |

| | $t$ = 25°C; *v.* Fig. 50 | | | $t$ = 30°C | | | $t$ = 35°C | | |
|---|---|---|---|---|---|---|---|---|---|
| | % $Na_2CO_3$ | % $NaHCO_3$ | % NaCl | % $Na_2CO_3$ | % $NaHCO_3$ | % NaCl | % $Na_2CO_3$ | % $NaHCO_3$ | % NaCl |
| | | | | $Na_2CO_3.7H_2O$ + NaCl | | | | | |
| F | 17.3 | | 15.5 | 21.2 | | 12.9 | | | |
| | 17.2 | | 15.4 | | | | | | |
| | | | | $Na_2CO_3.7H_2O$ + $Na_2CO_3.H_2O$ | | | | | |
| | | | | | | | 31.0 | | 2.5 |
| | | | | $Na_2CO_3.H_2O$ + NaCl | | | | | |
| | | | | 17.7 | | 15.0 | 16.8 | | 16.1 |
| | | | | NaCl | | | | | |
| G | | | 26.4 | | | 26.5 | | | 26.6 |
| | | | | NaCl + $NaHCO_3$ | | | | | |
| H | | 1.2 | 26.0 | | 1.2 | 26.1 | | 1.2 | 26.2 |
| | | | | $Na_2CO_3.10H_2O$ + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| | 19.84 | 1.34 | 5.01 | | | | | | |
| | 18.99 | 0.76 | 11.09 | | | | | | |
| | | | | $Na_2CO_3.10H_2O$ + $Na_2CO_3.7H_2O$ + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| R | 18.99 | 0.80 | 11.38 | 26.61 | 0.99 | 3.65 | | | |
| | | | | $Na_2CO_3.7H_2O$ + $Na_2CO_3.H_2O$ + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| | | | | 22.63 | 0.61 | 9.88 | 30.27 | 0.57 | 1.97 |
| | | | | $Na_2CO_3.H_2O$ + NaCl + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| | | | | 17.79 | 0.53 | 14.88 | 17.04 | 0.61 | 15.52 |
| | | | | $Na_2CO_3.7H_2O$ + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| | 18.56 | 0.53 | 12.84 | | | | | | |
| | | | | $Na_2CO_3.7H_2O$ + NaCl + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| Q | 17.28 | 0.34 | 15.28 | | | | | | |
| | | | | NaCl + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| | 13.28 | 0.61 | 17.72 | 13.2 | 0.99 | 17.69 | 13.23 | 0.57 | 17.85 |
| | 7.28 | 0.53 | 21.35 | 7.33 | 0.96 | 21.30 | 7.42 | 0.61 | 21.41 |
| | | | | $NaHCO_3$ + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| | 11.35 | 2.90 | 7.57 | 11.20 | 3.32 | 7.70 | 11.57 | 3.59 | 7.61 |
| | 6.65 | 1.95 | 15.04 | 6.7 | 2.25 | 14.96 | 6.72 | 2.56 | 14.85 |
| | | | | | | | 5.52 | 2.10 | 16.97 |
| | | | | $NaHCO_3$ + NaCl + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| P | 2.55 | 1.38 | 23.97 | 25.3 | 1.68 | 24.01 | 3.25 | 0.76 | 23.75 |
| | | | | | | | 3.01 | 1.34 | 23.92 |
| | | | | $Na_2CO_3.H_2O$ + $Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| | | | | | | | 21.96 | 0.12 | 8.3 |
| | | | | | | | 18.46 | 0.11 | 12.08 |

| | $t$ = 45°C | | | $t$ = 60°C | | |
|---|---|---|---|---|---|---|
| | % $Na_2CO_3$ | % $NaHCO_3$ | % NaCl | % $Na_2CO_3$ | % $NaHCO_3$ | % NaCl |
| | | | $NaHCO_3$ | | | |
| | | 12.0 | | | | |
| | | | $NaHCO_3$ + $Na_2CO_3.NaHCO_3.2H_2O$ | | | |
| | 16.9 | 5.9 | | | 16.9 | 7.4 |
| | | | $Na_2CO_3.NaHCO_3.2H_2O$ + $Na_2CO_3.H_2O$ | | | |
| | 31.7 | 0.9 | | 30.7 | 1.3 | |
| | | | $Na_2CO_3.H_2O$ | | | |
| | 32.2 | | | 31.8 | | |
| | | | $Na_2CO_3.H_2O$ + NaCl | | | |
| | 15.0 | | 17.4 | 13.9 | | 17.8 |
| | | | NaCl | | | |
| | | | 26.7 | | | 27.0 |
| | | | NaCl + $NaHCO_3$ | | | |
| | | 1.5 | 26.2 | | 2.2 | 26.4 |

**$Cl^- CO_3^{--} HCO_3^- Na^+$.—(*Continued*)**

| $t$ = 45°C | | | $t$ = 60°C | | |
|---|---|---|---|---|---|
| % $Na_2CO_3$ | % $NaHCO_3$ | % NaCl | % $Na_2CO_3$ | % $NaHCO_3$ | % NaCl |
| $Na_2CO_3.H_2O + Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| 23.35 | 1.03 | 7.84 | 25.89 | 1.57 | 4.73 |
| 18.97 | 0.50 | 12.62 | 18.87 | 0.80 | 11.94 |
| $Na_2CO_3.H_2O + NaCl + Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| 14.34 | 0.61 | 17.40 | 12.39 | 0.53 | 19.13 |
| $Na_2CO_3.NaHCO_3.2H_2O + NaCl$ | | | | | |
| 9.25 | 0.15 | 20.62 | 10.75 | 0.73 | 20.06 |
| 6.84 | 0.50 | 21.98 | | | |
| 6.29 | 0.76 | 22.35 | | | |
| 4.29 | 1.11 | 23.43 | | | |
| $NaHCO_3 + Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| 12.44 | 5.08 | 5.38 | 14.0 | 6.11 | 3.73 |
| 10.75 | 3.29 | 8.91 | 8.99 | 4.16 | 11.34 |
| 6.94 | 2.52 | 14.70 | | | |
| $NaHCO_3 + NaCl + Na_2CO_3.NaHCO_3.2H_2O$ | | | | | |
| 3.04 | 1.99 | 23.91 | 3.28* | 2.20* | 24.1* |

* Average of two results.

**$Cl^- CO_3^{--} Mg^{++} Na^+$**
$H_2O + MgCO_3 + NaCl$
$t$ = 23°C (69)

| g NaCl/l | g $MgCO_3$/l |
|---|---|
| | $MgCO_3$(?) |
| | 0.176 |
| 28.0 | 0.418 |
| 59.5 | 0.527 |
| 106.3 | 0.585 |
| 147.4 | 0.544 |
| 231.1 | 0.460 |
| 272.9 | 0.393 |
| 331.4 | 0.293 |

**$Cl^- CO_3^{--} Ca^{++} Na^+$**
$H_2O + H_2CO_3 + CaCO_3 +$ NaCl
$t$ = 25°C (59)

| % $CaCO_3$* | % NaCl* |
|---|---|
| | $CaCO_3$ |
| 0.147 | 1.427 |
| 0.151 | 5.375 |
| 0.162 | 6.076 |
| 0.156 | 9.943 |
| 0.148 | 13.646 |
| 0.133 | 16.380 |
| 0.094 | 22.992 |
| 0.076 | 26.369 |

* Liquid phase at all compositions saturated with $CO_2$ at 760 mm.

**$Cl^- CO_3^{--} Ca^{++} Na^+$**
$H_2O + CaCO_3 + NaCl$
$t$ = 25°C (59)

| % NaCl | % $CaCO_3$ |
|---|---|
| | $CaCO_3$ |
| 1.575 | 0.00777 |
| 4.921 | 0.00817 |
| 8.466 | 0.00860 |
| 10.296 | 0.00923 |
| 14.279 | 0.00908 |
| 18.058 | 0.00942 |
| 23.369 | 0.00912 |

**$Cl^- CO_3^{--} Ca^{++} K^+$**
$H_2O + CaCO_3 + KCl$
$t$ = 25°C (64)

| % KCl | % $CaCO_3$ |
|---|---|
| | $CaCO_3$ |
| 0.0 | 0.0013 |
| 3.90 | 0.0078 |
| 7.23 | 0.0078 |
| 11.10 | 0.0076 |
| 13.82 | 0.0072 |
| 15.49 | 0.0076 |
| 18.21 | 0.0070 |
| 19.84 | 0.0072 |
| 26.00 | 0.0060 |

**$Cl^- CO_3^{--} Na^+$**; *v. also* p. 301

| % $Na_2CO_3$ | % NaCl |
|---|---|
| $Na_2CO_3.10H_2O + NaCl$† | |
| 17.37 | 15.73 |
| $t$ = 30°C (79) | |
| NaCl | |
| 0 | 26.28† |
| 0 | 26.47 |
| 5.05 | 21.94 |
| 9.71 | 18.76 |
| 14.81 | 16.26 |
| $NaCl + Na_2CO_3.H_2O$ | |
| 18.00* | 14.12* |
| $Na_2CO_3.H_2O$ | |
| 20.72 | 11.49 |
| $Na_2CO_3.7H_2O + Na_2CO_3.H_2O$ | |
| 22.75* | 10.24* |
| $Na_2CO_3.7H_2O$ | |
| 24.26 | 5.93 |
| 25.59 | 5.17 |
| $Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$ | |
| 26.82 | 4.15 |
| $Na_2CO_3.10H_2O$ | |
| 22.94† | 0.0 |
| 27.12 | 3.33 |
| 27.48 | 0.90 |
| 27.98 | 0 |

* Average of two values
† At 25°C (37).

**$Cl^- CO_3^{--} Na^+ K^+$**
$H_2O + NaCl + K_2CO_3$; *v.* Fig. 53; $t$ = 25°C (37)

| | Solid phases | Liquid phase—M per 1000M $H_2O$: $0.5Na_2CO_3$ | $0.5K_2CO_3$ | NaCl | KCl |
|---|---|---|---|---|---|
| A | $Na_2CO_3.10H_2O$ | 101.26 | | | |
| B | $Na_2CO_3.10H_2O + NaCl$ | 88.20 | | 72.40 | |
| C | NaCl | | | 109.8 | |
| D | NaCl + KCl | | | 92.08 | 39.32 |
| E | KCl | | | | 89.24 |
| F | $KCl + K_2CO_3.\frac{3}{2}H_2O$ | | 288.32 | | 5.0 |
| G | $K_2CO_3.\frac{3}{2}H_2O$ | | 295.86 | | |
| H | $NaKCO_3.6H_2O + K_2CO_3.\frac{3}{2}H_2O$ | 37.0 | 271.40 | | |
| I | $Na_2CO_3.7H_2O + NaKCO_3.6H_2O$ | 120.80 | 79.40 | | |
| J | $Na_2CO_3.7H_2O + Na_2CO_3.10H_2O$ | 121.0 | 49.40 | | |
| P | $K_2CO_3.\frac{3}{2}H_2O + NaKCO_3.6H_2O$ + KCl | 37.44 | 267.00 | | 4.44 |
| Q | $NaKCO_3.6H_2O + Na_2CO_3.7H_2O$ + KCl | 94.66 | 77.58 | 26.34 | |
| R | $Na_2CO_3.7H_2O + Na_2CO_3.10H_2O$ + KCl | 91.80 | 67.20 | 32.60 | |
| S | $Na_2CO_3.10H_2O + KCl + NaCl$ | 93.22 | | 48.66 | 33.28 |

**$Cl^- CO_3^{--} K^+$**
$H_2O + KCl + K_2CO_3$
$t$ = 30°C (390)

| % $K_2CO_3$ | % KCl |
|---|---|
| | $K_2CO_3.3\frac{1}{2}H_2O$ |
| 53.27 | 0 |
| $K_2CO_3.3\frac{1}{2}H_2O + KCl$ | |
| 52.22 | 1.03 |
| KCl | |
| 51.66 | 1.07 |
| 1.64 | 26.22 |
| 0 | 28.01 |

**$Cl^- C_2O_4^{--} C_2H_2ClO_2^- K^+$**
$H_2O + HC_2H_2ClO_2 + CaCl_2 + K_2C_2O_4$; $t$ = 25°C (172)

| g $KC_2ClH_2O_2$/l* | g CaO/l* |
|---|---|
| | $CaC_2O_4$† |
| 0 | 0.1027 |
| 0.6628 | 0.0973 |
| 1.3256 | 0.0880 |
| 2.6512 | 0.0853 |
| 5.3024 | 0.0840 |
| 8.6164 | 0.0826 |
| 26.512 | 0.0740 |

**$Cl^- C_2O_4^{--} C_2Cl_3O_2^- Ca^{++} K^+$**
$H_2O + HC_2Cl_3O_2 + CaCl_2 + K_2C_2O_4$; $t$ = 25°C (172)

| g $KC_2Cl_3O_2$/l* | g CaO/l* |
|---|---|
| | $CaC_2O_4$† |
| 0 | 0.8867 |
| 1.0074 | 0.8867 |
| 2.0148 | 0.8833 |
| 4.0296 | 0.8867 |
| 10.074 | 0.8880 |
| 20.148 | 0.8747 |
| 40.296 | 0.8760 |
| 60.4444 | 0.8707 |
| 80.592 | 0.8593 |
| 120.888 | 0.8273 |
| 161.184 | 0.7860 |

**$Cl^- C_2O_4^{--} Th^{++++}$ (81, 168)**
$H_2O + HCl + Th(C_2O_4$
$t$ = 25°C (168)

| % HCl | % $Th(C_2O_4)_2$ |
|---|---|
| | $3Th(C_2O_4)_2.ThCl_4.20H_2O$ |
| 24.8 | 0.01545 |
| 37.0 | 0.5330 |
| 37.6 | 0.5395 |
| $t$ = 17°C (81) | |
| | $Th(C_2O_4)_2.?H_2O$ |
| 0.0 | 0.0017 |
| 1.2 | 0.0035 |
| 3.2 | 0.0047‡ |
| 3.6 | 0.0061 |
| 4.6 | 0.0094 |
| 8.4 | 0.017 |
| 13.1 | 0.028 |
| 16.2 | 0.038 |
| 19.8 | 0.064 |

*Continued on p. 303*

* Liquid phase contained 18.23 g HCl per l at all compositions. † Authors do not state whether solid used was hydrated. ‡ $t$ = 12°C.

**$Cl^-$ $CO_3^{--}$ $Na^+$ (141)**

$H_2O + NaCl + Na_2CO_3$; *v.* Fig. 51 and p. 300

| Solid phases | Liquid phase | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 15°C | | $t$ = 20°C | | $t$ = 25°C | | $t$ = 30°C | | $t$ = 35°C | | $t$ = 45°C | | $t$ = 60°C | |
| | % $Na_2CO_3$ | % NaCl | % $Na_2CO_3$ | % NaCl | % $Na_2CO_3$ | % NaCl | % $Na_2CO_3$ | % NaCl | % $Na_2CO_3$ | % NaCl | % $Na_2CO_3$ | % NaCl | % $Na_2CO_3$ | % NaCl | % $Na_2CO_3$ | % NaCl |
| | 6.6 | 0.0 | 14.1 | 0.0 | 17.6 | 0.0 | 22.7 | 0.0 | 28.5 | 0.0 | | | | | | |
| | 4.3 | 4.5 | 9.9 | 8.9 | 15.5 | 4.0 | 19.6 | 5.6 | 27 | 3.7 | | | | | | |
| $Na_2CO_3.10H_2O$ | 3.7 | 8.2 | 8.7 | 14.7 | 14.1 | 7.7 | 18.8 | 10.8 | | | | | | | | |
| | 3.1 | 12.3 | | | 12.9 | 12.8 | | | | | | | | | | |
| | 2.8 | 20.4 | | | | | | | | | | | | | | |
| $Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$ | | | | | | | 19.0 | 11.8 | 26.9 | 3.9 | | | | | | |
| | | | | | | | 18.4 | 13.0 | 26.6 | 4.2 | 32.9 | 0.0 | | | | |
| $Na_2CO_3.7H_2O$ | | | | | | | | | 24.6 | 7.2 | 31.5 | 2.0 | | | | |
| | | | | | | | | | 22.7 | 9.3 | | | | | | |
| $Na_2CO_3.7H_2O + Na_2CO_3.H_2O$ | | | | | | | | | 22.5 | 10.2 | 31 | 2.5 | | | | |
| | | | | | | | | | 21.9 | 10.4 | 30.2 | 2.9 | 32.2 | 0.0 | 31.8 | 0.0 |
| $Na_2CO_3.H_2O$ | | | | | | | | | 20.5 | 11.1 | 25.5 | 7.1 | 28.2 | 3.9 | 24.0 | 7.2 |
| | | | | | | | | | | | | | 24.4 | 7.3 | 20.2 | 10.9 |
| | | | | | | | | | | | | | 20.7 | 11.1 | 16.6 | 14.5 |
| $Na_2CO_3.7H_2O + NaCl$ | | | | | | | | | 21.2m | 12.9m | | | | | | |
| $Na_2CO_3.H_2O + NaCl$ | | | | | | | | | 17.7 | 15.0 | 16.8 | 16.1 | 15.0 | 17.4 | 13.9 | 17.8 |
| $Na_2CO_3.10H_2O + NaCl$ | 2.8 | 24.2 | 9.2 | 20.2 | 13.5 | 17.4 | | | | | | | | | | |
| | 1.1 | 25.1 | 3.5 | 24.0 | 6.9 | 22.0 | 7.9 | 21.3 | 5.0 | 22.7 | 7.4 | 21.7 | 10.3 | 20.2 | | |
| NaCl | 0.0 | 26.3 | 0.0 | 26.3 | 9.5 | 20.3 | 0.0 | 26.4 | 0.0 | 26.5 | 4.0 | 24.0 | 3.6 | 24.2 | | |
| | | | | | 11.5 | 18.9 | | | | | 0.0 | 26.6 | 0.0 | 26.7 | 0.0 | 27.0 |
| | | | | | 0.0 | 26.4 | | | | | | | | | | |
| $Na_2CO_3.7H_2O + NaCl$ | | | | | | | 17.25* | 15.45* | | | | | | | | |

Transition temperatures: $Na_2CO_3.10H_2O + Na_2CO_3.7H_2O + NaCl$ = 21°C. $Na_2CO_3.7H_2O + Na_2CO_3.H_2O + NaCl$ = 26.2°C.

* Average of two results.

**$Cl^-$ $CO_3^{--}$ $Na^+$ (141)**

$H_2O + NaOH + NaCl + Na_2CO_3$; *v.* Fig. 52 (25°)†

| | Solid phases | Liquid phase | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 0°C | | | $t$ = 15°C | | | $t$ = 20°C | | | $t$ = 25°C† | | |
| | | % $Na_2CO_3$ | % NaCl | % NaOH | % $Na_2CO_3$ | % NaCl | % NaOH | % $Na_2CO_3$ | % NaCl | % NaOH | % $Na_2CO_3$ | % NaCl | % NaOH |
| A | $Na_2CO_3.10H_2O$ | 6.6 | | | 14.1 | | | 17.6 | | | 22.7 | | |
| | $Na_2CO_3.7H_2O$ | | | | | | | | | | 18.4 | 13.0 | |
| B | $Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$ | | | | | | | | | | 19.0 | 11.8 | |
| C | $Na_2CO_3.7H_2O + NaCl$ | | | | 7.5 | 12.7 | 10.6 | 12.0 | 15.9 | 3.6 | 17.25 | 15.45 | |
| | | | | | | | | 9.6 | 13.4 | 8.5 | 15.9 | 15.0 | 1.7 |
| | | 2.8 | 24.2 | | 9.2 | 20.2 | | 13.5 | 17.4 | | | | |
| | $Na_2CO_3.10H_2O + NaCl$ | 2.4 | 17.3 | 8.4 | 9.2 | 19.4 | 1.5 | | | | | | |
| | | 2.4 | 12.7 | 14.3 | 8.4 | 16.2 | 5.8 | | | | | | |
| D | NaCl | | 26.3 | | | 26.3 | | | 26.4 | | | 26.4 | |
| | $NaCl + NaOH.4H_2O$ | | 4.2 | 30.3 | | | | | | | | | |
| | $NaOH.4H_2O$ | | | 29.6 | | | | | | | | | |
| E | $NaOH.H_2O$ | | | | | | 51.2 | | | 52.2 | | | 53.3 |
| G | $Na_2CO_3.H_2O + Na_2CO_3$ | | | | 0.6 | | 47.3 | 0.3 | | 41.5 | 0.5 | | 42.5 |
| H | $Na_2CO_3.7H_2O + Na_2CO_3.H_2O$ | 3.1 | | 23.0 | 7.9 | | 19.4 | 11.1 | | 16.2 | 15.4 | | 12.7 |
| | | 3.1 | | 22.3 | 8.9 | | 17.0 | 12.4 | | 13.4 | 18.0 | | 9.3 |
| I | $Na_2CO_3.7H_2O + Na_2CO_3.10H_2O$ | | | | | | | | | | 18.1 | 8.6 | 1.7 |
| | | | | | | | | | | | 18.3 | 3.3 | 6.3 |
| | $Na_2CO_3.10H_2O + NaCl + Na_2CO_3.7H_2O$ | 2.8 | 11.2 | 16.0 | 8.7 | 14.9 | 7.2 | 12.8 | 16.9 | 1.7 | | | |
| | $Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$ | 2.9 | 4.2 | 20.5 | 7.9 | 10.5 | 10.4 | 11.6 | 6.9 | 9.5 | | | |
| | | | | | 8.7 | 2.6 | 15.6 | 11.8 | 1.5 | 12.8 | | | |

$Cl^-$ $CO_3^{--}$ $Na^+$.—(*Continued*)

| | Solid phases | Liquid phase | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 0°C | | | $t$ = 15°C | | | $t$ = 20°C | | | $t$ = 25°C† | | |
| | | % $Na_2CO_3$ | % NaCl | % NaOH | % $Na_2CO_3$ | % NaCl | % NaOH | % $Na_2CO_3$ | % NaCl | % NaOH | % $Na_2CO_3$ | % NaCl | % NaOH |
| | $Na_2CO_3.7H_2O$ + $Na_2CO_3.H_2O$ | 3.4 | 4.2 | 22.1 | 8.2 | 9.6 | 13.6 | 10.1 | 7.5 | 12.4 | 14.9 | 6.4 | 8.6 |
| | | | | | 7.9 | 3.1 | 17.7 | 10.6 | 1.9 | 15.5 | 15.2 | 3.2 | 11.0 |
| P | $Na_2CO_3.7H_2O$ + $Na_2CO_3.H_2O$ + NaCl | 2.9 | 8.5 | 19.9 | 7.2 | 11.7 | 12.5 | 9.6 | 12.4 | 9.7 | 13.5 | 14.1 | 4.4 |
| | $Na_2CO_3.H_2O$ + NaCl | 2.2 | 6.9 | 23.1 | 1.9 | 7.4 | 23.1 | 7.0 | 11.9 | 12.3 | 9.1 | 13.5 | 8.9 |
| | | 1.9 | 6.5 | 24.0 | 0.2 | 0.9 | 46.2 | 1.2 | 6.6 | 25.1 | 3.1 | 9.9 | 18.5 |
| | | 1.2 | 5.6 | 25.8 | | | | 1.7 | 0.9 | 46.7 | 0.3 | 1.5 | 41.5 |
| | | 0.6 | 4.3 | 29.2 | | | | | | | 0.3 | 1.3 | 44.0 |
| Q | $Na_2CO_3.H_2O$ + $Na_2CO_3$ + NaCl | | | | | | | | | | 0.5 | 1.1 | 45.7 |
| | $Na_2CO_3$ + NaCl | | | | | | | | | | 0.2 | 1.0 | 49.9 |

| Solid phases | Liquid phase | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 30°C | | | $t$ = 35°C | | | $t$ = 45°C | | | $t$ = 60°C | | |
| | % $Na_2CO_3$ | % NaCl | % NaOH | % $Na_2CO_3$ | % NaCl | % NaOH | % $Na_2CO_3$ | % NaCl | % NaOH | % $Na_2CO_3$ | % NaCl | % NaOH |
| $Na_2CO_3.10H_2O$ | 28.5 | | | | | | | | | | | |
| $Na_2CO_3.H_2O$ | | | | | | | 32.2 | | | 31.8 | | |
| $Na_2CO_3.7H_2O$ | 24.6 | 7.2 | | 32.9 | | | | | | | | |
| $Na_2CO_3.10H_2O$ + $Na_2CO_3.7H_2O$ | 26.9 | 3.9 | | | | | | | | | | |
| $Na_2CO_3.7H_2O$ + $Na_2CO_3.H_2O$ | 22.05 | 10.2 | | 31.0 | 2.5 | | | | | | | |
| $Na_2CO_3.7H_2O$ + NaCl | 21.20 | 12.9 | | | | | | | | | | |
| $Na_2CO_3.H_2O$ + NaCl | 17.7 | 15.0 | | 16.8 | 16.1 | | 15.0 | 17.4 | | 13.9 | 17.8 | |
| NaCl | | 26.5 | | | 26.6 | | | 26.5 | | | 27.0 | |
| $NaOH.H_2O$ | | | 54.3 | | | 55.4 | | | 57.8 | | | 63.5 |
| $Na_2CO_3.H_2O$ + $Na_2CO_3$ | 15.1* | | 35.0 | 0.5 | | 39.2 | | | | | | |
| $Na_2CO_3.7H_2O$ + $Na_2CO_3.H_2O$ | 21.9 | | 7.9 | 32.0 | | 0.6 | | | | | | |
| $Na_2CO_3.7H_2O$ + $Na_2CO_3.10H_2O$ | 26.7 | | 3.5 | | | | | | | | | |
| | 26.7 | 1.2 | 2.2 | | | | | | | | | |
| $Na_2CO_3.7H_2O$ + $Na_2CO_3.H_2O$ | 23.1 | 7.6 | 1.5 | | | | | | | | | |
| | 22.4 | 2.9 | 5.2 | | | | | | | | | |
| | 6.0 | 12.5 | 12.4 | 11.0 | 15.3 | 5.4 | 9.2 | 16.0 | 6.1 | 5.8 | 15.8 | 9.4 |
| $Na_2CO_3.H_2O$ + NaCl | 0.2 | 3.0 | 34.6 | 4.6 | 11.8 | 14.7 | 2.9 | 10.8 | 18.1 | 2.6 | 11.3 | 18.1 |
| | | | | 1.4 | 7.0 | 24.9 | 0.4 | 3.8 | 33.4 | 1.7 | 8.4 | 22.3 |
| $Na_2CO_3.H_2O$ + $Na_2CO_3$ + NaCl | 0.2 | 1.5 | 41.8 | 0.3 | 1.8 | 40.8 | 0.3 | 2.7 | 37.2 | 0.5 | 4.3 | 33.2 |
| | 0.2 | 1.0 | 51.3 | 1.0 | 1.2 | 49.0 | 0.3 | 2.4 | 38.8 | 0.2 | 1.7 | 52.6 |
| $Na_2CO_3$ + NaCl | | | | | | | 0.2 | 2.1 | 40.9 | | | |
| | | | | | | | 0.5 | 1.3 | 54.1 | | | |

* Solution not clear. † Data for points representing systems $Na_2CO_3$ + $NaOH.H_2O$; NaCl + $NaOH.H_2O$; and $NaOH.H_2O$ + NaCl lacking.

$Cl^-$ $HCO_3^-$ $Na^+$ [141]: $H_2O$ + NaCl + $NaHCO_3$

| Solid phases | Liquid phase | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 15°C | | $t$ = 20°C | | $t$ = 25°C | | $t$ = 30°C | | $t$ = 35°C | | $t$ = 45°C | | $t$ = 60°C | |
| | % $NaHCO_3$ | % NaCl | % $NaHCO_3$ | % NaCl | % $NaHCO_3$ | % NaCl | % $NaHCO_3$ | % NaCl | % $NaHCO_3$ | % NaCl | % $NaHCO_3$ | % NaCl | % $NaHCO_3$ | % NaCl | % $NaHCO_3$ | % NaCl |
| $NaHCO_3$ | 6.5 | 0.0 | 8.1 | 0.0 | 8.7 | 0.0 | 9.3 | 0.0 | 9.9 | 0.0 | 10.6 | 0.0 | 12.0 | 0.0 | 14.1 | 0.0 |
| | 2.7 | 8.8 | 3.8 | 8.6 | 4.2 | 8.5 | 3.2 | 12.7 | 4.9 | 8.8 | 4.7 | 10.3 | 5.8 | 10.5 | 7.4 | 10.0 |
| | 1.1 | 19.8 | 2.0 | 16.4 | 1.7 | 19.5 | 1.8 | 19.7 | 1.9 | 19.5 | 2.1 | 19.6 | 2.7 | 19.2 | 3.7 | 19.1 |
| $NaHCO_3$ + NaCl | 0.6 | 25.9 | 0.9 | 26.1 | 1.0 | 26.1 | 1.2 | 26.0 | 1.2 | 26.1 | 1.3 | 26.2 | 1.5 | 26.2 | 2.2 | 26.4 |
| NaCl | | 26.3 | | 26.3 | | 26.4 | | 26.4 | | 26.5 | | 26.6 | | 26.7 | | 27.0 |

**$Cl^-$ $C_2O_4^{--}$ $Th^{++++}$.**—(*Continued from p. 300*)

| % HCl | % $Th(C_2O_4)_2$ |
|---|---|
| $t$ = 50°C (81) | |
| $Th(C_2O_4)_2.?H_2O$ | |
| 0.0 | 0.0017 |
| 4.1 | 0.010 |
| 8.4 | 0.028 |
| 12.4 | 0.057 |
| 16.1 | 0.103 |
| 18.0 | 0.134 |
| 19.9 | 0.169 |
| 21.6 | 0.232 |

**$Cl^-$ $C_2O_4^{--}$ $Sc^{+++}$** (265)

$H_2O + HCl + Sc_2(C_2O_4)_3$

| $M_{HCl}$/l | % $Sc_2(C_2O_4)_3$ | |
|---|---|---|
| | $t$ = 25°C | $t$ = 50°C |
| $Sc_2(C_2O_4)_3.5H_2O$ | | |
| 0.1 | 0.0299 | 0.0420 |
| 0.5 | 0.0650 | 0.0870 |
| 1.0 | 0.1020 | 0.1435 |
| 2.0 | 0.1716 | 0.2556 |
| 5.0 | 0.4170 | 0.6533 |

**$Cl^-$ $C_2O_4^{--}$ $Ca^{++}$**

$H_2O + H_2C_2O_4 + CaCl_2$

$t$ = 25°C (172)

| g CaO/l | g HCl/l |
|---|---|
| $CaC_2O_4$‡ | |
| 0.004 | 0.0 |
| 0.314 | 4.559 |
| 0.5953 | 9.117 |
| 0.8846 | 13.676 |
| 1.156 | 18.234 |
| 1.454 | 22.793 |
| 1.718 | 27.351 |
| 2.282 | 36.468 |

**$Cl^-$ $C_2O_4^{--}$ $Ca^{++}$ $K^+$**

$H_2O + HCl + CaCl_2 + K_2C_2O_4$

$t$ = 25°C (172)

| g KCl/l* | g CaO/l* |
|---|---|
| $CaC_2O_4$† | |
| 0 | 1.1666 |
| 0.3728 | 1.1706 |
| 0.7456 | 1.174 |
| 1.4912 | 1.1833 |
| 3.728 | 1.194 |
| 7.456 | 1.221 |
| 14.912 | 1.2686 |
| 22.368 | 1.3093 |
| 37.280 | 1.396 |

**$Cl^-$ $C_2O_4^{--}$ $Na^+$** (82)

$H_2O + NaCl + Na_2C_2O_4$

| °C | % NaCl | % $Na_2C_2O_4$ |
|---|---|---|
| NaCl + $Na_2C_2O_4$ | | |
| 15 | 26.28 | 0.027 |
| 50 | 26.64 | 0.063 |

**$Cl^-$ $C_2O_4^{--}$ $K^+$** (82, 385)

$H_2O + KCl + K_2C_2O_4$

| °C (82) | % KCl | % $K_2C_2O_4$ |
|---|---|---|
| KCl + $K_2C_2O_4.H_2O$ | | |
| 15 | 19.19 | 10.03 |
| 50 | 20.26 | 15.18 |
| $t$ = 20°C (385) | | |
| % KCl | % $K_2C_2O_4$ | |
| KCl | | |
| 34.41 | 0.0 | |
| 32.05 | 6.03 | |
| 29.31 | 13.11 | |
| KCl + $K_2C_2O_4.H_2O$ | | |
| 28.56 | 15.08 | |
| $K_2C_2O_4.H_2O$ | | |
| 21.49 | 18.81 | |
| 13.67 | 23.92 | |
| 5.70 | 29.98 | |
| 0.0 | 34.93 | |

**$Cl^-$ $C_2H_3O_2^-$ $C_4H_4O_6^{--}$ $Ca^{++}$ $K^+$**

$H_2O + HCl + Ca(C_2H_3O_2)_2 + K_2C_4H_4O_6$

$t$ = 25°C (172)

| g KCl/l | g CaO/l |
|---|---|
| $CaC_4H_4O_6$† | |
| 0.0 | 0.4733 |
| 0.3728 | 0.4860 |
| 0.7456 | 0.4926 |
| 1.4912 | 0.5206 |
| 3.7280 | 0.5600 |
| 7.456 | 0.6140 |
| 14.912 | 0.7120 |
| 22.368 | 0.8706 |
| 29.824 | 1.0746 |

*v. also* $C_2H_3O_2^-$ $C_4H_4O_6^{--}$ $Ca^{++}$ $K^+$, p. 374

**$Cl^-$ $C_4H_4O_6^{--}$ $C_2H_2ClO_2^-$ $Ca^{++}$ $K^+$**

$H_2O + HC_2H_2ClO_2 + CaCl_2 + K_2C_4H_4O_6$

$t$ = 25°C (172)

| g $KC_2ClH_2O_2$/l | g CaO/l |
|---|---|
| $CaC_4H_4O_6$† | |
| 0 | 3.695 |
| 1.3256 | 3.623 |
| 2.6512 | 3.586 |
| 5.3024 | 3.477 |
| 13.256 | 3.263 |
| 19.884 | 3.093 |
| 26.512 | 3.001 |

**$Cl^-$ $HC_4H_4O_6^-$ $Na^+$ $K^+$**

$H_2O + NaCl + KHC_4H_4O_6$

$t$ = 25°C (283)

| $M_{NaCl}$/l | $M_{KHC_4H_4O_6}$/l |
|---|---|
| $KHC_4H_4O_6$ | |
| 0 | 0.0347 |
| 0.05 | 0.03761 |
| 0.10 | 0.03974 |
| 0.20 | 0.04276 |

**$Cl^-$ $HC_4H_4O_6^-$ $K^+$**

$H_2O + HCl + KHC_4H_4O_6$

$t$ = 25°C (283)

| $M_{HCl}$/l | $M_{KHC_4H_4O_6}$/l |
|---|---|
| $KHC_4H_4O_6$ | |
| 0.0 | 0.0347 |
| 0.0125 | 0.03667 |
| 0.025 | 0.04282 |
| 0.050 | 0.05887 |

**$Cl^-$ $HC_4H_4O_6^-$ $K^+$** (48, 283)

$H_2O + KCl + KHC_4H_4O_6$

$t$ = 22°C (48)

M/1000g $H_2O$

| KCl | $KHC_4H_4O_6$ |
|---|---|
| $KHC_4H_4O_6$ | |
| 0.0 | 0.03057 |
| 0.01 | 0.02634 |
| 0.02 | 0.02281 |
| 0.035 | 0.01890 |
| 0.05 | 0.01580 |
| 0.10 | 0.01078 |
| 0.2 | 0.00705 |
| 0.35 | 0.00488 |
| 0.50 | 0.00397 |
| 1.00 | 0.00269 |
| 2.0 | 0.00189 |
| *dl*-$KHC_4H_4O_6$ | |
| 0.0 | 0.02822 |
| 0.01 | 0.02392 |
| 0.02 | 0.02045 |
| 0.035 | 0.01676 |
| 0.05 | 0.01405 |
| 0.10 | 0.00939 |
| 0.20 | 0.00604 |
| 0.35 | 0.00424 |
| 0.50 | 0.00340 |
| 1.00 | 0.00233 |
| 2.00 | 0.00164 |

**$Cl^-$ $HC_4H_4O_6^-$ $K^+$.**—(*Cont'd*)

M/1000g $H_2O$

| KCl | $KHC_4H_4O_6$ |
|---|---|
| $t$ = 25°C (283)* | |
| $KHC_4H_4O_6$ | |
| 0 | 0.0347 |
| 0.025 | 0.02544 |
| 0.050 | 0.01955 |
| 0.100 | 0.01333 |
| 0.200 | 0.00869 |

* All values are mean of two results

**$Cl^-$ $C_6H_5(NH_3)^-$ $Fe^{+++}$**

$H_2O + HCl + C_6H_5(NH_2) + FeCl_3$

$t$ = 25°C (291)

| % $C_6H_5(NH_2)$·HCl | % $FeCl_3$ | % HCl |
|---|---|---|
| $C_6H_5(NH_2)$HCl | | |
| 22.78 | 0.0 | 11.08 |
| $6C_6H_5(NH_2)HCl.FeCl_3$ | | |
| 20.24 | 1.29 | 11.78 |
| 17.17 | 2.82 | 11.88 |
| 13.81 | 5.18 | 11.32 |
| 7.06 | 12.12 | 11.44 |
| 5.29 | 16.06 | 11.69 |
| 4.49 | 18.16 | 11.91 |
| 3.96 | 19.95 | 11.49 |
| $6C_6H_5(NH_2)HCl.FeCl_3$ + $2C_6H_5(NH_2)HCl.FeCl_3$ | | |
| 3.57 | 21.50 | 12.89 |
| $2C_6H_5(NH_2)HCl.FeCl_3$ | | |
| 2.58 | 23.36 | 12.96 |
| 2.10 | 25.59 | 12.48 |
| 1.71 | 28.61 | 11.71 |
| 1.35 | 33.10 | 10.98 |

**$Cl^-$ $C_{10}H_7SO_3^-$ $Na^+$** (85)

$H_2O + NaCl + \beta\text{-}C_{10}H_7SO_3Na$

| $t$ = 25°C | | $t$ = 30°C | | $t$ = 40°C | | $t$ = 50°C | | $t$ = 65°C | |
|---|---|---|---|---|---|---|---|---|---|
| % $\beta$-salt | % NaCl | % $\beta$-salt | % NaCl | % $\beta$-salt | % NaCl | % $\beta$-salt | % NaCl | % $\beta$-salt | % NaCl |
| $\beta$-$C_{10}H_7SO_3Na$ | | | | | | | | | |
| 5.85 | 0.0 | 6.24 | 0.0 | 7.98 | 0.0 | 9.75 | 0.0 | 14.6 | 6 |
| 3.46 | 2.38 | 1.21 | 4.84 | 1.46 | 5.62 | 4.15 | 2.9 | 8.47 | 2.93 |
| 0.31 | 9.19 | 0.16 | 13.08 | 0.65 | 8.47 | 2.17 | 5.42 | 6.12 | 3.81 |
| 0.15 | 13.16 | 0.0 | 26.5 | 0.0 | 26.7 | 1.05 | 8.39 | 1.96 | 7.19 |
| 0.0 | 16.81 | | | | | 0.0 | 26.8 | 1.26 | 10.83 |
| 0.0 | 26.43 | | | | | | | 0.0 | 27.21 |

**$Cl^-$ $Sn^{++}$**

$H_2O + HCl + SnCl_2$

$t$ = 0°C (119)

| M ½$SnCl_2$/l | $M_{HCl}$/l |
|---|---|
| (?)* | |
| 7.4 | 0 |
| 6.67 | 0.66 |
| 6.375 | 1.354 |
| 6.840 | 2.480 |
| 8.120 | 3.49 |
| 9.42 | 4.00 |
| 11.76 | 4.40 |
| 14.76 | 4.94 |
| 15.64 | 6.60 |
| 15.70 | 7.80 |

* Composition of solid phases not determined.

**$Cl^-$ $Sn^{++}$ $K^+$**

$H_2O + SnCl_2 + KCl$

$t$ = 25°C (143)

g per 100g $H_2O$

| KCl | $SnCl_2$ |
|---|---|
| $SnCl_2.2H_2O$ | |
| 0.0 | 234.05 |
| 2.73 | 222.55 |
| 7.49 | 235.50 |
| 19.66 | 290.30 |
| $SnCl_2.KCl.H_2O$ | |
| 25.51 | 337.20 |
| 24.38 | 247.50 |
| 21.26 | 170.70 |
| 17.79 | 107.65 |
| 19.06 | 81.78 |
| 17.85 | 58.48 |
| 19.45 | 54.19 |

* Liquid phase contained 18.23 g HCl per l at all compositions.

† Authors do not state whether solid used was hydrated.

‡ Authors do not give actual composition of solid used.

### $Cl^-$ $Sn^{++}$ $K^+$.—(*Continued*)

g per 100g $H_2O$

| KCl | $SnCl_2$ |
|---|---|
| $SnCl_2.2KCl.2H_2O$ | |
| 5.99 | 34.28 |
| 24.40 | 27.88 |
| 24.68 | 17.42 |
| 27.30 | 10.24 |
| 30.65 | 5.83 |
| 31.76 | 5.95 |
| KCl | |
| 34.08 | 4.37 |
| 32.17 | 2.86 |
| 34.73 | 0.0 |

### $Cl^-$ $Pb^{++}$

$H_2O + HCl + PbCl_2$

$t = 25.2°C$ (117)

| $M_{HCl}/l$ | M ½$PbCl_2$/l |
|---|---|
| $PbCl_2$ | |
| 0.0 | 0.0388 |
| 0.001 | 0.0386 |
| 0.0025 | 0.03806 |
| 0.005 | 0.03714 |
| 0.010 | 0.03545 |
| 0.020 | 0.03213 |
| 0.060 | 0.02281 |
| 0.100 | 0.01647 |
| 0.250 | 0.00889 |
| 0.500 | 0.00546 |
| 0.700 | 0.00483 |
| 1.000 | 0.00445 |
| 1.500 | 0.00462 |
| 2.000 | 0.00512 |
| 3.000 | 0.00754 |

### $Cl^-$ $Pb^{++}$ $Ca^{++}$

$H_2O + PbCl_2 + CaCl_2$

$t = 25°C$ (181)

| M ½$CaCl_2$/l | M ½$PbCl_2$/l |
|---|---|
| $PbCl_2$ | |
| 0.00 | 0.07790 |
| 0.52 | 0.01392 |
| 0.95 | 0.01126 |
| 1.91 | 0.01542 |
| 3.03 | 0.02436 |
| 4.12 | 0.04114 |

### $Cl^-$ $Pb^{++}$ $Sr^{++}$

$H_2O + PbCl_2 + SrCl_2$

$t = 25°C$ (181)

| M ½$SrCl_2$/l | M ½$PbCl_2$/l |
|---|---|
| $PbCl_2$ | |
| 0.00 | 0.07790 |
| 0.051 | 0.01356 |
| 1.02 | 0.01280 |
| 1.38 | 0.01648 |
| 2.66 | 0.02836 |
| 3.09 | 0.03156 |
| 4.13 | 0.05396 |

### $Cl^-$ $Pb^{++}$ $Ba^{++}$

$H_2O + PbCl_2 + BaCl_2$

$t = 25°C$ (181)

| M ½$BaCl_2$/l | M ½$PbCl_2$/l |
|---|---|
| $PbCl_2$ | |
| 0.00 | 0.07790 |
| 0.32 | 0.01398 |
| 0.64 | 0.01106 |

### $Cl^-$ $Pb^{++}$ $Ba^{++}$.—(*Continued*)

| M ½$BaCl_2$/l | M ½$PbCl_2$/l |
|---|---|
| $PbCl_2$ | |
| 1.38 | 0.02178 |
| 2.08 | 0.04776 |

### $Cl^-$ $Pb^{++}$ $Na^+$

$H_2O + PbCl_2 + NaCl$

$t = 25°C$ (181)

| $M_{NaCl}/l$ | M ½$PbCl_2$/l |
|---|---|
| $PbCl_2$ | |
| 0.0 | 0.07790 |
| 0.051 | 0.01289 |
| 1.02 | 0.01262 |
| 2.05 | 0.01922 |
| 3.03 | 0.02558 |
| 4.10 | 0.08754 |

### $Cl^-$ $Pb^{++}$ $K^+$; *cf. also* (51.1)

$H_2O + PbCl_2 + KCl$

$t = 20°C$ (47); *v.* Fig. 54

| % $PbCl_2$ | % KCl |
|---|---|
| $KCl + PbCl_2.KCl.\frac{1}{3}H_2O$ | |
| 0.289 | 25.34 |
| $PbCl_2.KCl.\frac{1}{3}H_2O$ | |
| 0.247 | 23.71 |
| 0.215 | 21.69 |
| 0.194 | 19.83 |
| $PbCl_2.KCl.\frac{1}{3}H_2O + 2PbCl_2.KCl$ | |
| 0.183 | 18.26 |
| $2PbCl_2.KCl$ | |
| 0.158 | 16.70 |
| 0.124 | 14.04 |
| 0.106 | 10.47 |
| 0.103 | 9.12 |
| 0.107 | 6.93 |
| 0.149 | 4.28 |
| $2PbCl_2.KCl + PbCl_2$ | |
| 0.174 | 3.79 |
| $PbCl_2$ | |
| 0.184 | 2.79 |
| 0.202 | 2.23 |
| 0.264 | 1.45 |

Solid phases* (102)

A $PbCl_2$

B $PbCl_2 + 2PbCl_2.KCl$

C $2PbCl_2.KCl + 3PbCl_2.3KCl.H_2O$

D $3PbCl_2.3KCl.H_2O + KCl$

* No numerical data given for liquid phase; diagram (Fig. 54) shows grams of $PbCl_2$ and KCl per 100 g of solution.

### $Cl^-$ $Tl^{+++}$ $Cs^+$

$H_2O + TlCl_3 + CsCl$

$t = 15°C$ (253)

| % $TlCl_3$* | % $TlCl_3$* |
|---|---|
| $TlCl_3.4H_2O$ | |
| 65.178 | |
| $TlCl_3.4H_2O + 2TlCl_3.3CsCl$ | |
| 65.181 | |
| $2TlCl_3.3CsCl$ | |
| 61.18 | 23.813 |
| 50.127 | 10.210 |
| 40.970 | 1.451 |
| 31.705 | 0.017 |

* Concentration of CsCl not appreciable.

### $Cl^-$ $Tl^{+++}$ $Cs^+$.—(*Continued*)

| % CsCl† | % CsCl† |
|---|---|
| $2TlCl_3.3CsCl + TlCl_3.2CsCl.2H_2O$ | |
| | 3.275 |
| $TlCl_3.3CsCl.2H_2O$ | |
| 3.272 | 22.781 |
| 8.313 | 26.930 |
| 15.781 | |
| $TlCl_3.2CsCl.2H_2O + TlCl_3.3CsCl.H_2O$ | |
| | 27.200 |
| $TlCl_3.3CsCl.H_2O$ | |
| 27.689 | 39.913 |
| 32.721 | 45.126 |
| $TlCl_3.3CsCl.H_2O + TlCl_3.3CsCl$ | |
| | 45.227 |
| $TlCl_3.3CsCl$ | |
| 45.910 | 58.170 |
| 50.000 | 63.981 |
| $TlCl_3.3CsCl + CsCl$ | |
| | 64.713 |
| CsCl | |
| | 64.750 |

† Concentration of $TlCl_3$ not appreciable.

### $Cl^-$ $Zn^{++}$

$H_2O + ZnO + ZnCl_2$

$t$ = room (109)

g per 100g $H_2O$

| $ZnCl_2$ | ZnO |
|---|---|
| ZnO | |
| 8.22 | 0.0137 |
| 23.24 | 0.138 |
| 45.95 | 0.497 |

### $Cl^-$ $Zn^{++}$.—(*Continued*)

g per 100g $H_2O$

| $ZnCl_2$ | ZnO |
|---|---|
| ZnO | |
| 51.50 | 0.604 |
| 56.90 | 0.723 |
| 62.85 | 0.884 |
| 96.00 | 1.792 |
| 124.70 | 3.213 |
| 144.80 | 2.64 |
| 203.00 | 1.59 |

### $Cl^-$ $Zn^{++}$ $K^+$

$H_2O + ZnCl_2 + KCl$

$t = 25°C$ (247)

| % KCl | % $ZnCl_2$ |
|---|---|
| $ZnCl_2$ | |
| 0.0 | 82.0 |
| $ZnCl_2 + 2KCl.ZnCl_2.6H_2O$ | |
| 0.75 | 74.0 |
| $2KCl.ZnCl_2.6H_2O$ | |
| 1.50 | 67.5 |
| 2.00 | 66.5 |
| 3.33 | 64.0 |
| 8.25 | 57.5 |
| 18.75 | 46.8 |
| 25.75 | 41.0 |
| 31.00 | 38.0 |
| $KCl + 2KCl.ZnCl_2.6H_2O$ | |
| 33.50 | 36.5 |
| KCl | |
| 35.00 | 35.5 |
| 36.50 | 35.0 |
| 33.75 | 31.75 |
| 29.00 | 21.50 |
| 26.50 | 0.0 |

### $Cl^-$ $Cd^{++}$ $Na^+$ (371)

$H_2O + CdCl_2 + NaCl$; *v.* Fig. 55

| Solid phases | Liquid phase—g per 100g $H_2O$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t$ = 19.3°C | | $t$ = 29.7°C | | $t$ = 40.1°C | | $t$ = 54.4°C | |
| | $CdCl_2$ | NaCl | $CdCl_2$ | NaCl | $CdCl_2$ | NaCl | $CdCl_2$ | NaCl |
| $CdCl_2.\frac{5}{2}H_2O$ | 111.30 | | 129.65 | 0.0 | | | | |
| $CdCl_2.H_2O$ | | | | | 133.85 | 0.0 | 133.9 | 0.0 |
| $CdCl_2.\frac{5}{2}H_2O + CdCl_2.2NaCl.3H_2O$ | 116.64 | 7.52 | 132.67 | 9.63 | | | | |
| $CdCl_2.H_2O + CdCl_2.2NaCl.3H_2O$ | | | | | 137.03 | 15.14 | 140.42 | 19.10 |
| $CdCl_2.2NaCl.3H_2O$ | 85.15 | 12.19 | 123.54 | 10.10 | 48.17 | 29.50 | 52.76 | 32.97 |
| | 40.01 | 25.67 | 106.16 | 12.92 | | | | |
| | | | 91.10 | 15.41 | | | | |
| | | | 43.74 | 27.46 | | | | |
| $CdCl_2.2NaCl.3H_2O$ + NaCl | 5.96 | 36.76 | 9.43 | 37.54 | 13.31 | 38.16 | 22.53 | 39.07 |
| NaCl | 0.0 | 35.84 | 0.0 | 35.88 | 0.0 | 36.18 | 0.0 | 36.82 |

Transition points

$CdCl_2.\frac{5}{2}H_2O + CdCl_2.H_2O$ + solution = 33°C.

$CdCl_2.\frac{5}{2}H_2O + CdCl_2.H_2O + CdCl_2.2NaCl.3H_2O$ + solution = 32.5°C.

### $Cl^-$ $Cd^{++}$ $K^+$ (371): $H_2O + CdCl_2 + KCl$; *v.* Fig. 56

| Solid phases | Liquid phase—g per 100g $H_2O$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t$ = 19.3°C | | $t$ = 29.7°C | | $t$ = 40.1°C | | $t$ = 54.5°C | |
| | $CdCl_2$ | KCl | $CdCl_2$ | KCl | $CdCl_2$ | KCl | $CdCl_2$ | KCl |
| $CdCl_2.\frac{5}{2}H_2O$ | 111.30 | 0.0 | 129.65 | 0.0 | | | | |
| | | | 97.62 | 0.70 | | | | |
| $CdCl_2.H_2O$ | | | | | 133.85 | 0.0 | 133.90 | 0.0 |
| $CdCl_2.\frac{5}{2}H_2O + CdCl_2.KCl.H_2O$ | 59.59 | 6.70 | 68.23 | 7.08 | | | | |
| $CdCl_2.H_2O + CdCl_2.KCl.H_2O$ | | | | | 92.15 | 2.70 | 102.15 | 2.32 |

### $Cl^- Cd^{++} K^+$.—(*Continued*)

| Solid phases | Liquid phase—g per 100g $H_2O$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t$ = 19.3°C | | $t$ = 29.7°C | | $t$ = 40.1°C | | $t$ = 54.5°C | |
| | $CdCl_2$ | KCl | $CdCl_2$ | KCl | $CdCl_2$ | KCl | $CdCl_2$ | KCl |
| $CdCl_2.KCl.H_2O$ | 26.98 | 11.09 | 47.12 | 9.89 | 51.90 | 11.50 | 44.01 | 18.39 |
| | | | 32.67 | 13.06 | 37.91 | 15.21 | | |
| | | | 24.26 | 16.10 | 24.45 | 21.73 | | |
| | | | 15.99 | 25.97 | 18.97 | 35.51 | | |
| $CdCl_2.KCl.H_2O$ + $CdCl_2.4KCl$ | 11.61 | 30.04 | 15.47 | 33.58 | 19.92 | 37.63 | 26.13 | 43.78 |
| $CdCl_2.4KCl$ + KCl | 1.44 | 34.76 | 2.42 | 37.66 | 2.98 | 40.45 | 4.20 | 45.52 |
| KCl | 0.0 | 33.94 | 0.0 | 37.21 | 0.0 | 40.36 | 0.0 | 43.00 |

Transition points

$CdCl_2.\frac{5}{2}H_2O$ + $CdCl_2.H_2O$ + solution = 33°C.

$CdCl_2.\frac{5}{2}H_2O$ + $CdCl_2.H_2O$ + $CdCl_2.KCl.H_2O$ + solution = 33.5°C.

### $Cl^- Hg^{++}$

$H_2O + HCl + HgCl_2$

$t$ = 0°C (119)

| M $\frac{1}{2}HgCl_2$/l (?)* | $M_{HCl}$/l |
|---|---|
| 0.97 | 0.43 |
| 1.98 | 0.99 |
| 3.55 | 1.78 |
| 5.56 | 2.69 |
| 6.89 | 3.225 |
| 7.2375 | 3.425 |
| 8.55 | 4.15 |
| 8.865 | 4.81 |
| 9.568 | 7.088 |

* Composition of solid phase not determined.

### $Cl^- Hg^{++}$

$H_2O + HgO + HgCl_2$

$t$ = 25°C (382)

| % $HgCl_2$ | % HgO |
|---|---|
| $HgCl_2$ | |
| 8.58 | 0.0 |
| Solid soln. I * | |
| 8.72 | 0.14 |
| 8.68 | 0.07 |
| $HgCl_2.2HgO$ | |
| 8.69 | 0.10 |
| 4.39 | 0.09 |
| 0.66 | 0.02 |
| $HgCl_2.2HgO$ + $HgCl_2.4HgO$ | |
| 0.66 | 0.02 |
| $HgCl_2.4HgO$ | |
| 0.61 | 0.02 |
| 0.20 | 0.06 |
| Solid soln. II† | |
| 0.13 | 0.04 |
| 0.05 | 0.04 |
| HgO | |
| 0.04 | 0.04 |
| 0.0 | 0.001 |

* Solid soln. I = $HgCl_2$ + $HgCl_2.2HgO$.

† Solid soln. II = $HgCl_2.4HgO$ + $HgCl_2$.

### $Cl^- Hg^{++} Cu^{++}$

$H_2O + HgCl_2 + CuCl_2$

$t$ = 35°C (359)

| % $CuCl_2$ | % $HgCl_2$ |
|---|---|
| $CuCl_2.2H_2O$ | |
| 44.47 | 0 |
| 33.50 | 21.03 |
| 26.07 | 37.3 |
| 23.31 | 44.47 |

### $Cl^- Hg^{++} Cu^{++}$.—(*Continued*)

| % $CuCl_2$ | % $HgCl_2$ |
|---|---|
| $CuCl_2.2H_2O$ + $HgCl_2$ | |
| 21.50* | 50.47* |
| $HgCl_2$ | |
| 19.40 | 52.44 |
| 18.48 | 52.54 |
| 18.06 | 52.81 |
| 14.73 | 51.03 |
| 5.94 | 49.50 |
| 2.64 | 23.87 |
| 0 | 8.51 |

* Mean of several determinations.

### $Cl^- Hg^{++} Mg^{++}$

$H_2O + HgCl_2 + MgCl_2$

$t$ = 25°C (182)

| $M_{MgCl_2}$/l | $M_{HgCl_2}$/l (?)‡ |
|---|---|
| 0 | 0.265 |
| 0.168 | 0.374 |
| 0.415 | 0.719 |
| 0.570 | 1.131 |
| 0.997 | 1.864 |
| 1.320 | 2.569 |
| 1.728 | 3.206 |

### $Cl^- Hg^{++} Ca^{++}$

$H_2O + HgCl_2 + CaCl_2$

$t$ = 25°C (182)

| $M_{CaCl_2}$/l | $M_{HgCl_2}$/l (?)‡ |
|---|---|
| 0 | 0.265 |
| 0.190 | 0.364 |
| 0.402 | 0.766 |
| 0.656 | 1.108 |
| 0.964 | 1.811 |
| 1.429 | 2.645 |
| 1.723 | 3.304 |

### $Cl^- Hg^{++} Sr^{++}$

$H_2O + HgCl_2 + SrCl_2$

$t$ = 25°C (182)

| $M_{HgCl_2}$/l | $M_{SrCl_2}$/l (?)‡ |
|---|---|
| 0.265 | 0 |
| 0.315 | 0.164 |
| 0.563 | 0.311 |
| 0.829 | 0.519 |
| 1.342 | 0.724 |
| 1.776 | 1.046 |
| 2.293 | 1.386 |

‡ Composition of solid phase not determined: probably $HgCl_2$.

### $Cl^- Hg^{++} Ba^{++}$ (341): $H_2O + HgCl_2 + BaCl_2$; *v.* Fig. 57

| | $t$ = 0°C | | $t$ = 30°C | | $t$ = 0°C | | $t$ = 30°C | |
|---|---|---|---|---|---|---|---|---|
| | % $BaCl_2$ | % $HgCl_2$ | % $BaCl_2$ | % $HgCl_2$ | % $BaCl_2$ | % $HgCl_2$ | % $BaCl_2$ | % $HgCl_2$ |
| | $BaCl_2.2H_2O$ | | | | $BaCl_2.3HgCl_2.6H_2O$ | | | |
| A | 23.70 | 0.0 | 27.77 | 0.0 | 23.28 | 46.59 | | |
| | 24.00 | 14.25 | 27.47 | 7.09 | 21.05 | 47.78 | | |
| | 24.89 | 36.20 | 26.89 | 22.61 | $BaCl_2.3HgCl_2.6H_2O$ + $HgCl_2$ | | | |
| | | | 25.22 | 46.50 | D 20.68* | 48.46* | | |
| | $BaCl_2.2H_2O$ + $HgCl_2$ | | | | $HgCl_2$ | | | |
| B | | | 23.18* | 55.22* | 18.50 | 44.33 | 17.87 | 48.97 |
| | $BaCl_2.3HgCl_2.6H_2O$ + $BaCl_2.2H_2O$ | | | | 11.59 | 29.00 | 14.26 | 41.30 |
| | | | | | 6.11 | 16.36 | 8.41 | 27.62 |
| C | 24.05* | 46.08* | | | 0.0 | 3.95 | 2.65 | 14.18 |
| | | | | | E | | 0.0 | 7.67 |

| °C (137) | Solid phases | Liquid phase % $BaCl_2$ | Liquid phase % $HgCl_2$ |
|---|---|---|---|
| 10.4 | $BaCl_2.2H_2O$ + $BaCl_2.3HgCl_2.6H_2O$ | 23.6 | 50.5 |
| 10.4 | $HgCl_2$ + $BaCl_2.3HgCl_2.6H_2O$ | 21.6 | 51.9 |
| 25 | $BaCl_2.2H_2O$ + $HgCl_2$ | 23.00 | 54.8 |
| 40 | $BaCl_2.2H_2O$ + $HgCl_2$ | 22.98 | 56.57 |
| 17.2 | $BaCl_2.3HgCl_2.6H_2O$ + $BaCl_2.2H_2O$ + $HgCl_2$† | | |

* Average of several determinations. † Invariant point.

### $Cl^- Hg^{++} Li^+$

$H_2O + HgCl_2 + LiCl$

$t$ = 25°C (182)

| $M_{LiCl}$/l | $M_{HgCl_2}$/l (?)‡ |
|---|---|
| 0 | 0.265 |
| 0.414 | 0.351 |
| 0.835 | 0.666 |
| 1.271 | 1.021 |
| 1.738 | 1.678 |
| 2.265 | 2.214 |
| 3.091 | 2.896 |
| 3.527 | 3.062 |

### $Cl^- Hg^{++} Na^+$

$H_2O + HgCl_2 + NaCl$

$t$ = 25°C (182)

| $M_{HgCl_2}$/l | $M_{NaCl}$/l (?)‡ |
|---|---|
| 0.265 | 0 |
| 0.372 | 0.212 |
| 0.508 | 0.416 |
| 0.748 | 0.671 |
| 1.192 | 1.153 |
| 2.022 | 1.941 |
| 2.754 | 2.783 |
| 3.434 | 3.162 |

### $Cl^- Cu^+$

$H_2O + HCl + CuCl$

$t$ = 25°C (282)

M per 1000g $H_2O$

| HCl | CuCl |
|---|---|
| | CuCl (?) |
| 1.1650 | 0.1165 |
| 0.31652 | 0.01988 |
| 0.2156 | 0.01340 |
| 0.09784 | 0.00596 |

‡ Composition of solid phase not determined; probably $HgCl_2$.

### $Cl^- Cu^+ Cu^{++}$

$H_2O + HCl + CuCl + CuCl_2$

$t$ = 25°C (299)

| $M_{CuCl}$/l | $M_{CuCl_2}$/l |
|---|---|
| CuCl | |
| 0.0862* | 0.0* |
| 0.1016* | 0.1001* |
| 0.1254* | 0.2002* |
| 0.1449* | 0.3003* |
| 0.1703* | 0.4004* |
| 0.1919* | 0.5005* |
| 0.2365† | 0.0† |
| 0.2588† | 0.0940† |
| 0.2750† | 0.1410† |
| 0.2886† | 0.1880† |
| 0.3035† | 0.2350† |
| 0.3218† | 0.2820† |
| 0.7714‡ | 0.0‡ |
| 0.7884‡ | 0.0473‡ |
| 0.8098‡ | 0.0946‡ |
| 0.8281‡ | 0.1420‡ |
| 0.8476‡ | 0.1894‡ |
| 0.8673‡ | 0.2367‡ |
| 0.9252‡ | 0.3788‡ |
| 0.9439‡ | 0.4261‡ |
| 0.9646‡ | 0.4734‡ |

* Liquid phase contained per l: 1M HCl.

† 2M HCl.

‡ 4M HCl.

### $Cl^- Cu^+ Fe^{++}$

$H_2O + CuCl + FeCl_2$

$t$ = 21.5°C (236)

g per 100g $H_2O$

| CuCl | $FeCl_2$ |
|---|---|
| CuCl | |
| 1.53* | 0.0 |
| 1.33 | 6.02* |
| 1.81 | 11.62 |

**$Cl^-$ $Cu^+$ $Fe^{++}$.—(*Continued*)**

g per 100g $H_2O$

| CuCl | $FeCl_2$ |
|---|---|
| CuCl | |
| 3.11 | 16.3 |
| 7.13 | 26.31 |
| 8.06 | 29.35 |
| 9.56 | 33.12 |
| 12.44 | 43.75 |
| 17.04 | 54.00 |
| 21.60 | 66.40 |
| $CuCl + FeCl_2.4H_2O$ | |
| 23.30 | 73.20 |
| $FeCl_2.4H_2O$ | |
| 21.66 | 71.89 |
| 11.90 | 69.34 |
| 0.0 | 65.10 |

Transition point, $FeCl_2.4H_2O + FeCl_2.2H_2O$ + solution = 65.2°C.

* Most of the figures here given represent the average of two determinations.

**$Cl^-$ $Cu^+$ $Na^+$**

$H_2O + CuCl + NaCl$

$t$ = 26.5°C (236)

g per 100g $H_2O$

| CuCl | NaCl |
|---|---|
| CuCl | |
| 1.56 | 0.0 |
| 3.15 | 10.80 |
| 7.30 | 20.70 |
| 40.60 | 27.00 |
| 49.10 | 36.48 |
| CuCl + NaCl | |
| 57.21 | 44.14 |
| NaCl | |
| 41.10 | 55.10 |
| 41.70 | 56.80 |
| 18.70 | 50.90 |

**$Cl^-$ $Cu^+$ $K^+$**

$H_2O + CuCl + KCl$

$t$ = 22°C (47)

| % CuCl | % KCl |
|---|---|
| CuCl | |
| 0.405 | 6.560 |
| 1.370 | 9.840 |
| 4.840 | 15.30 |
| 10.430 | 20.27 |
| 13.32 | 21.64 |
| CuCl + CuCl.2KCl | |
| 21.46* | 25.11* |
| CuCl.2KCl | |
| 15.48 | 23.87 |
| 13.99 | 23.57 |
| 14.44 | 23.76 |
| 11.39 | 23.50 |
| 7.35 | 23.49 |
| 4.53 | 24.04 |
| 3.14 | 25.03 |
| 2.20 | 26.28 |
| CuCl.2KCl + KCl | |
| 1.76* | 27.03* |
| KCl | |
| 0.58 | 26.32 |
| 0.0 | 25.68 |

* Mean of several results.

**$Cl^-$ $Cu^+$ $K^+$.—(*Continued*)**

$t$ = 25°C (388)

| M % KCl | M % CuCl |
|---|---|
| KCl | |
| 8.0 | 0.0 |
| 1.49 | 0.20 |
| 0.90 | 0.23 |
| 0.85 | 0.25 |
| KCl + 2KCl.CuCl | |
| 0.75 | 0.25 |
| 2KCl.CuCl | |
| 0.75 | 0.30 |
| 0.80 | 0.40 |
| 0.85 | 0.52 |
| 1.05 | 0.80 |
| 1.15 | 0.90 |
| 1.22 | 1.00 |
| 1.35 | 1.10 |
| 1.50 | 1.25 |
| 1.55 | 1.25 |
| $2KCl.CuCl + KCl.CuCl.H_2O$ | |
| 1.62 | 1.32 |
| $KCl.CuCl.H_2O$ | |
| 1.45 | 1.44 |
| 1.25 | 1.55 |
| 1.24 | 1.65 |
| 1.20 | 1.66 |
| 1.15 | 1.75 |
| 1.10 | 1.80 |
| 1.05 | 1.85 |
| 1.00 | 1.90 |
| 0.95 | 1.97 |
| 0.90 | 2.05 |
| CuCl | |
| 0.62 | 2.10 |
| 0.54 | 1.91 |
| 0.25 | 0.96 |
| 0.18 | 0.68 |
| 0.09 | 0.27 |

**$Cl^-$ $Cu^{++}$ (136)**

$H_2O + HCl + CuCl_2$

$t$ = 0°C

| % $CuCl_2$ | % HCl |
|---|---|
| $CuCl_2.2H_2O$ | |
| 40.92 | 0.0 |
| 34.82 | 3.72 |
| 23.82 | 10.35 |
| 15.64 | 16.71 |
| 12.12 | 21.82 |
| 11.92 | 25.64 |
| 13.86 | 29.02 |
| $CuCl_2.2H_2O + CuCl_2.HCl.3H_2O$ | |
| 17.42 | 31.16 |
| $CuCl_2.HCl.3H_2O$ | |
| 15.66 | 32.66 |
| 14.13 | 34.55 |
| 12.29 | 36.82 |
| 11.85 | 37.19 |

$t$ = 25°C

| | |
|---|---|
| $CuCl_2.2H_2O$ | |
| 43.32 | 0.0 |
| 32.85 | 6.52 |
| 23.74 | 12.95 |
| 18.34 | 18.08 |
| 17.71 | 19.92 |

**$Cl^-$ $Cu^{++}$.—(*Continued*)**

| % $CuCl_2$ | % HCl |
|---|---|
| $CuCl_2.2H_2O$ | |
| 17.01 | 22.26 |
| 18.20 | 25.07 |
| 22.65 | 27.76 |
| 23.29 | 27.94 |
| 24.07 | 28.05 |
| 25.65 | 28.49 |

**$Cl^-$ $Cu^{++}$ $Sr^{++}$**

$H_2O + CuCl_2 + SrCl_2$

$t$ = 25°C (161)

M per 1000g $H_2O$

| $0.5CuCl_2$ | $0.5SrCl_2$ |
|---|---|
| $SrCl_2.6H_2O$ | |
| 0.0 | 7.034 |
| 0.7134 | 6.812 |
| 2.276 | 6.352 |

**$Cl^-$ $Cu^{++}$ $Ba^{++}$ (347, 350)**

$H_2O + CuCl_2 + BaCl_2$

$t$ = 30°C

| % $BaCl_2$ | % $CuCl_2$ |
|---|---|
| $BaCl_2.2H_2O$ | |
| 26.70 | 0.0 |
| 17.08 | 11.49 |
| 5.49 | 30.76 |
| $BaCl_2.2H_2O + CuCl_2.2H_2O$ | |
| 2.72 | 42.36 |
| $CuCl_2.2H_2O$ | |
| 1.25 | 42.45 |
| 0.0 | 43.95 |

$t$ = 40°C

| | |
|---|---|
| $BaCl_2.2H_2O$ | |
| 28.98 | 0.0 |
| $BaCl_2.2H_2O + CuCl_2.2H_2O$ | |
| 3.72 | 42.72 |
| $CuCl_2.2H_2O$ | |
| 0.0 | 44.67 |

**$Cl^-$ $Cu^{++}$ $Ba^{++}$.—(*Continued*)**

| % $BaCl_2$ | % $CuCl_2$ |
|---|---|
| $t$ = 60°C | |
| $BaCl_2.2H_2O$ | |
| 31.70 | 0.0 |
| $BaCl_2.2H_2O + CuCl_2.2H_2O$ | |
| 6.87 | 43.57 |
| $CuCl_2.2H_2O$ | |
| 0.0 | 47.42 |

**$Cl^-$ $Cu^{++}$ $Ba^{++}$ $Na^+$**; *see below*

**$Cl^-$ $Cu^{++}$ $Li^+$**

$H_2O + CuCl_2 + LiCl$

$t$ = 30°C (358)

| % $CuCl_2$ | % LiCl |
|---|---|
| $CuCl_2.2H_2O$ | |
| 43.40 | 0 |
| 40.20 | 2.50 |
| 39.5 | 2.90 |
| 34.9 | 6.20 |
| 27.9 | 11.80 |
| 24.2 | 13.80 |
| 22.7 | 16.30 |
| 20.7 | 19.0 |
| $CuCl_2.2H_2O + CuCl_2.LiCl.2H_2O$ | |
| 19.6 | 22.2 |
| $CuCl_2.LiCl.2H_2O$ | |
| 16.2 | 28.6 |
| 13.6 | 29.70 |
| 7.3 | 36.30 |
| 4.4 | 40.3 |
| 2.7 | 42.8 |
| $CuCl_2.LiCl.2H_2O + LiCl.H_2O$ | |
| 1.8 | 45.4 |
| $LiCl.H_2O$ | |
| 1.7 | 45.5 |
| 0 | 46.3 |

**$Cl^-$ $Cu^{++}$ $Ba^{++}$ $Na^+$: $H_2O + CuCl_2 + BaCl_2 + NaCl$**; *v.* Fig. 58

$t$ = 30°C (347)

| | Solid phases | Liquid phase: % $BaCl_2$ | % $CuCl_2$ | % NaCl |
|---|---|---|---|---|
| A | $BaCl_2.2H_2O$ | 26.70 | | |
| B | $BaCl_2.2H_2O + NaCl$ | 3.80 | | 23.74 |
| C | NaCl | | | 26.47 |
| D | $NaCl + CuCl_2.2H_2O$ | | 36.86 | 10.25 |
| E | $CuCl_2.2H_2O$ | | 43.95 | |
| F | $CuCl_2.2H_2O + BaCl_2.2H_2O$ | 2.72 | 42.36 | |
| P | $BaCl_2.2H_2O + CuCl_2.2H_2O + NaCl$ | 1.97 | 36.12 | 10.49 |

**$Cl^-$ $Cu^{++}$ $Ba^{++}$ $K^+$**; *v.* p. 307

**$Cl^-$ $Cu^{++}$ $Na^+$ (345, 347): $H_2O + CuCl_2 + NaCl$**

| Solid phases | Liquid phase—g per 100g $H_2O$: $t$ = 15°C (345) | | $t$ = 25°C (345) | | $t$ = 35°C (345) | | $t$ = 30°C (347) | |
|---|---|---|---|---|---|---|---|---|
| | $CuCl_2$ | NaCl | $CuCl_2$ | NaCl | $CuCl_2$ | NaCl | $CuCl_2$ | NaCl |
| $CuCl_2.2H_2O$.. | 73.30 | | 76.66 | | 80.17 | | 43.95 | |
| | | | | | | | 41.06 | 4.28 |

*Continued on page 307*

### $Cl^-$ $Cu^{++}$ $Ba^{++}$ $K^+$ (350): $H_2O + CuCl_2 + BaCl_2 + KCl$; *v.* Fig. 59

| | Solid phases | Liquid phase—g per 100g of dissolved salts | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 40°C | | | | $t$ = 60°C; *v.* Fig. 59 | | | |
| | | $BaCl_2$ | $CuCl_2$ | KCl | $H_2O$ | $BaCl_2$ | $CuCl_2$ | KCl | $H_2O$ |
| | $BaCl_2.2H_2O$ | 100 | | | 245.00 | 100.00 | | | 215.5 |
| A | $BaCl_2.2H_2O + CuCl_2.2H_2O$ | 8.01 | 91.99 | | 115.3 | 13.62 | 86.38 | | 98.25 |
| | $CuCl_2.2H_2O$ | | 100.00 | | 123.9 | | 100.00 | | 110.9 |
| B | $CuCl_2.2H_2O + CuCl_2.KCl$ | | | | | | 77.24 | 22.76 | 66.47 |
| C | $CuCl_2.KCl + CuCl_2.2KCl.2H_2O$ | | | | | | 71.73 | 28.27 | 65.07 |
| | $CuCl_2.2H_2O + CuCl_2.2KCl.2H_2O$ | | 81.74 | 18.26 | 86.5 | | | | |
| D | $CuCl_2.2KCl.2H_2O + KCl$ | | 51.50 | 48.50 | 125.30 | | 50.43 | 49.57 | 89.79 |
| | KCl | | | 100.00 | 249.3 | | | 100.00 | 220.5 |
| E | $KCl + BaCl_2.2H_2O$ | 27.62 | | 72.38 | 201.8 | 39.11 | | 60.89 | 163.7 |
| P | $KCl + BaCl_2.2H_2O + CuCl_2.2KCl.2H_2O$ | 11.62 | 44.04 | 44.34 | 115.14 | 10.98 | 45.27 | 43.75 | 83.96 |
| Q | $BaCl_2.2H_2O + CuCl_2.2KCl.2H_2O + CuCl_2.KCl$ | | | | | 7.74 | 66.58 | 25.67 | 63.02 |
| R | $BaCl_2.2H_2O + CuCl_2.KCl + CuCl_2.2H_2O$ | | | | | 8.03 | 71.72 | 20.25 | 62.68 |
| | $BaCl_2.2H_2O + CuCl_2.2H_2O + CuCl_2.2KCl.2H_2O$ | 5.44 | 76.57 | 17.99 | 82.01 | | | | |

### $Cl^-$ $Cu^{++}$ $Na^+$.—(*Continued from p. 306*)

| Solid phases | Liquid phase—g per 100g $H_2O$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t$ = 15°C (345) | | $t$ = 25°C (345) | | $t$ = 35°C (345) | | $t$ = 30°C (347) | |
| | $CuCl_2$ | NaCl | $CuCl_2$ | NaCl | $CuCl_2$ | NaCl | $CuCl_2$ | NaCl |
| $CuCl_2.2H_2O$ + NaCl | 65.84 | 18.69 | 68.77 | 20.38 | 73.59 | 21.35 | 36.86 | 10.25 |
| | | 35.77 | | 36.25 | | 36.20 | 32.40 | 12.25 |
| NaCl | | | | | | | 16.98 | 18.44 |
| | | | | | | | | 26.47 |

### $Cl^-$ $Cu^{++}$ $K^+$ (267, 350): $H_2O + CuCl_2 + KCl$

| °C | Solid phases (267) | Liquid phase | |
|---|---|---|---|
| | | % $CuCl_2$ | % KCl |
| 39.4 | $CuCl_2.2KCl.2H_2O + KCl$ | 22.75 | 22.49 |
| 49.9 | | 24.46 | 24.17 |
| 60.4 | | 26.93 | 26.27 |
| 79.1 | | 31.86 | 29.85 |
| 90.5 | | 35.64 | 32.37 |
| 93.7 | $CuCl_2.KCl + KCl$ | 36.79 | 32.79 |
| 98.8 | | 37.36 | 34.05 |
| 0 | | 40.59 | 4.41 |
| 39.6 | $CuCl_2.2KCl.2H_2O + CuCl_2.2H_2O$ | 44.00 | 10.30 |
| 50.1 | | 44.18 | 12.40 |
| 52.9 | | 45.71 | 13.03 |
| 60.2 | $CuCl_2.KCl + CuCl_2.2H_2O$ | 46.65 | 13.87 |
| 72.60 | | 48.38 | 13.24 |
| 64.2 | $CuCl_2.2KCl.2H_2O + CuCl_2.KCl$ | 42.93 | 18.53 |
| 72.5 | $CuCl_2.KCl$ | 40.54 | 22.78 |
| 92.3 *ca.* | $CuCl_2.2KCl.2H_2O + CuCl_2.KCl + KCl$ | | |
| 55.1 *ca.* | $CuCl_2.2KCl.2H_2O + CuCl_2.KCl + CuCl_2.2H_2O$ | | |

| Solid phases (350) | Liquid phase | | | |
|---|---|---|---|---|
| | $t$ = 40°C | | $t$ = 60°C | |
| | % $CuCl_2$ | % KCl | % $CuCl_2$ | % KCl |
| $CuCl_2.2H_2O$ | 44.67 | | 47.42 | |
| $CuCl_2.2H_2O + CuCl_2.2KCl.2H_2O$ | 43.83 | 9.79 | | |
| $CuCl_2.2KCl.2H_2O + KCl$ | 22.85 | 21.53 | 26.57 | 26.12 |
| KCl | | 28.63 | | 31.20 |
| $CuCl_2.2H_2O + CuCl_2.KCl$ | | | 46.4 | 13.67 |
| $CuCl_2.KCl + CuCl_2.2KCl.2H_2O$ | | | 43.45 | 17.13 |

### $Cl^-$ $Mn^{++}$ $Co^{++}$: $H_2O + MnCl_2 + CoCl_2$; *v.* Fig. 60

$t$ = 15–20°C (366)

| Solid phases M % $MnCl_2.6H_2O$ or $MnCl_2.4H_2O$ | Liquid phase M % $MnCl_2$ in salts ($MnCl_2$, $CoCl_2$) | Solid phases M % $MnCl_2.6H_2O$ or $MnCl_2.4H_2O$ | Liquid phase M % $MnCl_2$ in salts ($MnCl_2$, $CoCl_2$) |
|---|---|---|---|
| Solid soln. I* | | Solid soln. II† | |
| | | 50.4 | 75.0 |
| 7.3 | 20.0 | 73.5 | 63.6 |
| 15.4 | 33.3 | 74.1 | 66.7 |
| 16.8 | 42.9 | 81.5 | 75.0 |
| 21.8 | 50.0 | 86.5 | 83.3 |
| 31.4 | 57.1 | 91.4 | 90.9 |
| 37.1 | 66.7 | 92.1 | 91.7 |

* Solid soln. I, red, contains from 0 to 37M % $MnCl_2.6H_2O$. † Solid soln. II, violet, contains from 74.5 to 100M % $MnCl_2.4H_2O$. The solution saturated with the two saturated mixed crystals contained approximately 6.3M % $MnCl_2$, 3.1M % $CoCl_2$, and 90.6M % $H_2O$.

### $Cl^-$ $Mn^{++}$ $K^+$ (372): $H_2O + MnCl_2 + KCl$; *v.* Fig. 61

| Solid phases | Liquid phase | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 6°C | | $t$ = 28.4°C | | $t$ = 62.6°C | |
| | % $MnCl_2$ | % KCl | % $MnCl_2$ | % KCl | % $MnCl_2$ | % KCl |
| $MnCl_2.4H_2O$ | 40.23 | 0.0 | 44.46 | 0.0 | | |
| $MnCl_2.2H_2O$ | | | | | 51.86 | 0.0 |
| $MnCl_2.4H_2O + MnCl_2.KCl.2H_2O + KCl$ | 35.94 | 9.41 | | | | |
| $MnCl_2.2H_2O + MnCl_2.KCl.2H_2O$ | | | | | 49.95 | 6.67 |
| $MnCl_2.4H_2O + MnCl_2.KCl.2H_2O$ | | | 43.28 | 8.66 | | |
| $MnCl_2.KCl.H_2O + MnCl_2.2KCl.2H_2O$ | | | 38.65 | 13.79 | 44.05 | 12.49 |
| $MnCl_2.2KCl.2H_2O + MnCl_2.4KCl + KCl$ | | | | | 36.85 | 18.77 |
| KCl | 0.0 | 23.06 | 0.0 | 26.91 | 0.0 | 31.57 |

| Transition points | % $MnCl_2$ | % KCl |
|---|---|---|
| At 52.8°C, $MnCl_2.4H_2O + MnCl_2.2H_2O + MnCl_2.KCl.2H_2O$ + Solution | 50.14 | 6.11 |
| At 58.3°C, $MnCl_2.4H_2O + MnCl_2.2H_2O$ + Solution | 51.73 | |

### $Cl^-$ $MnO_4^-$ $K^+$ (319): $H_2O + KCl + KMnO_4$

| Solid phase | °C | Liquid phase—M per liter | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | KCl | $KMnO_4$ | KCl | $KMnO_4$ | KCl | $KMnO_4$ | KCl | $KMnO_4$ |
| $KMnO_4$ | 0 | 0.1 | 0.1395 | 0.5 | 0.076 | 1 | 0.0532 | 2 | 0.0379 |
| | 25 | 0.1 | 0.4315 | 0.5 | 0.306 | 1 | 0.220 | 2 | 0.1432 |
| | 40 | 0.1 | 0.738 | 0.5 | 0.584 | 1 | 0.444 | 2 | 0.288 |

### $Cl^-$ $Fe^{++}$ $Mg^{++}$ $K^+$

$H_2O + FeCl_2 + MgCl_2 + KCl$ [39]; *v.* Fig. 63

| | Solid phases | Liquid phase in g | | | |
|---|---|---|---|---|---|
| | | $FeCl_2$ | $MgCl_2$ | KCl | $H_2O$ |
| | $t$ = 22.8°C | | | | |
| | $FeCl_2.4H_2O$ | 100 | | | 151.2 |
| | $MgCl_2.6H_2O$ | | 100 | | 181.0 |
| | KCl | | | 100 | 282.7 |
| | $FeCl_2.4H_2O + FeCl_2.MgCl_2.8H_2O$* + $MgCl_2.6H_2O$ | 15.79 | 84.14 | | 160.6 |
| | $MgCl_2.6H_2O + MgCl_2.KCl.6H_2O$ | | 98.58 | 1.42 | 177.4 |
| | $MgCl_2.KCl.6H_2O$ + KCl | | 89.27 | 10.72 | 233.4 |
| | $FeCl_2.4H_2O$ + KCl | 79.77 | | 20.21 | 112.5 |
| | $FeCl_2.4H_2O + MgCl_2.KCl.6H_2O$ + KCl | 51.89 | 30.25 | 13.87 | 140.7 |
| | $FeCl_2.4H_2O + MgCl_2.6H_2O + MgCl_2.KCl.6H_2O$ | 16.18 | 82.85 | 0.85 | 161.2 |
| | $t$ = 43.2°C | | | | |
| | $FeCl_2.4H_2O$ | 100 | | | 137 |
| | $MgCl_2.6H_2O$ | | 100 | | 171.8 |
| | KCl | | | 100 | 242.6 |
| A | $FeCl_2.4H_2O + MgCl_2.FeCl_2.8H_2O + FeCl_2.2H_2O$† | 28.03 | 71.97 | | 147 |
| B | $MgCl_2.6H_2O + FeCl_2.MgCl_2.8H_2O$ | 19.38 | 80.62 | | 150.4 |
| C | $MgCl_2.6H_2O + MgCl_2.KCl.6H_2O$ | | 98.58 | 1.41 | 168.1 |
| D | $MgCl_2.KCl.6H_2O$ + KCl | | 87.19 | 12.81 | 215.0 |
| E | $FeCl_2.KCl.2H_2O$ + KCl | 76.69 | | 23.32 | 95.4 |
| F | $FeCl_2.4H_2O + FeCl_2.KCl.2H_2O$ | 78.71 | | 21.29 | 103.5 |
| P | $KCl + MgCl_2.KCl.6H_2O + FeCl_2.KCl.2H_2O$ | 51.53 | 31.89 | 16.56 | 125.7 |
| Q | $FeCl_2.4H_2O + MgCl_2.KCl.6H_2O + FeCl_2.KCl.2H_2O$ | 52.30 | 36.18 | 11.56 | 129.7 |
| R | $FeCl_2.4H_2O + MgCl_2.KCl.6H_2O + FeCl_2.MgCl_2.8H_2O$ | 31.57 | 65.36 | 3.04 | 141.9 |

* This solid first begins to appear at 22.8°C.
† This solid first begins to appear at 43.2°C.

### $Cl^-$ $Fe^{+++}$ [17]

$H_2O + HCl + FeCl_3$; *v.* Fig. 62 and *also* p. 309

| | °C | Solid phases | Liquid phase M per 1000M $H_2O$ | |
|---|---|---|---|---|
| | | | $FeCl_3$ | HCl |
| A | 27.4 | $FeCl_3.6H_2O + FeCl_3.\frac{7}{2}H_2O$ | 24.3 | |
| B | 15 | | 23.50 | 10.75 |
| C | 30 | $FeCl_3.\frac{7}{2}H_2O + FeCl_3.\frac{5}{2}H_2O$ | 30.24 | |
| D | 15 | | 28.35 | 14.90 |
| E | 55 | $FeCl_3.\frac{5}{2}H_2O + FeCl_3.2H_2O$ | 40.64 | |
| F | 30 | | 36.75 | 17.15 |
| G | 66 | $FeCl_3.2H_2O + FeCl_3$ | 58.40 | |
| H | 50 | | 52.50 | 20.04 |
| I | −60 | $FeCl_3.6H_2O + FeCl_3.HCl.6H_2O$ | 3.7 *ca.* | 19.0 *ca.* |
| J | −15 | | 9.65 | 21.20 |
| K | 40 *ca.* | $FeCl_3.HCl.6H_2O + FeCl_3.HCl.4H_2O$ | 6.0 *ca.* | 25.3 *ca.* |
| L | −15 | | 15.80 | 24.50 |
| M | 65 *ca.* | $FeCl_3.HCl.4H_2O + FeCl_3.HCl.2H_2O$ | 28.5 *ca.* | 55.0 *ca.* |
| N | 40 | $FeCl_3 + FeCl_3.HCl.2H_2O$ | 48.64 | 42.01 |
| O | −13 | $FeCl_3.HCl.6H_2O + FeCl_3.6H_2O + FeCl_3.HCl.4H_2O$ | 18.00 | 22.40 |
| P | − 7.5 | $FeCl_3.6H_2O + FeCl_3.\frac{7}{2}H_2O + FeCl_3.HCl.4H_2O$ | 23.72 | 19.22 |
| Q | − 7.3 | $FeCl_3.\frac{7}{2}H_2O + FeCl_3.\frac{5}{2}H_2O + FeCl_3.HCl.4H_2O$ | 28.55 | 23.08 |
| R | −16.0 | $FeCl_3.\frac{5}{2}H_2O + FeCl_3.2H_2O + FeCl_3.HCl.4H_2O$ | 31.89 | 28.40 |
| S | −27.5 | $FeCl_3.HCl.2H_2O + FeCl_3.HCl.4H_2O + FeCl_3.2H_2O$ | 34.21 | 32.23 |
| T | 10 | $FeCl_3.HCl.2H_2O + FeCl_3.2H_2O$ | 39.95 | 35.04 |
| U | 29 | $FeCl_3.2H_2O + FeCl_3 + FeCl_3.HCl.2H_2O$ | 49.84 | 33.71 |
| | − 6 | $FeCl_3.HCl.6H_2O$ | 16.66m | 16.66m |
| | − 3 | $FeCl_3.HCl.4H_2O$ | 25.00 | 25.00 |
| | +45.7 | $FeCl_3.HCl.2H_2O$ | 50.00 | 50.00 |

### $Cl^-$ $Fe^{+++}$; *v also* p. 308

$H_2O + HCl + Fe_2O_3$

$t$ = 25°C (66)

| % $Fe_2O_3$* | % HCl* |
|---|---|
| $FeCl_3.HCl.2H_2O$ | |
| 34.61 | 59.88 |
| 33.27 | 60.23 |
| $FeCl_3.HCl.2H_2O + FeCl_3$ | |
| 32.78 | 54.71 |
| $FeCl_3 + FeCl_3.2H_2O$ | |
| 31.95 | 58.20 |
| $FeCl_3.2H_2O$ | |
| 34.42 | 59.12 |
| 34.07 | 55.71 |
| $FeCl_3.2H_2O + FeCl_3.2\frac{1}{2}H_2O$ | |
| 34.21 | 55.47 |
| $FeCl_3.2\frac{1}{2}H_2O + FeCl_3.7\frac{1}{2}H_2O$ | |
| 34.44 | 51.11 |
| $FeCl_3.7\frac{1}{2}H_2O + FeCl_3.6H_2O$ | |
| 33.04 | 46.72 |
| $FeCl_3.6H_2O$ | |
| 24.42 | 33.40 |
| $FeCl_3.6H_2O + Fe_2O_3.x$HCl.$H_2O$ | |
| 21.84 | 29.33 |
| Solid soln.† | |
| 16.82 | 22.55 |
| 14.62 | 19.53 |
| 11.76 | 15.28 |
| 9.84 | 12.67 |
| 7.64 | 9.91 |
| 5.25 | 6.80 |
| 2.85 | 3.66 |

* Includes data recalculated from work of Roozeboom and Schreinemakers (17).

† Solid soln. = $Fe_2O_3$ + HCl + $H_2O$.

### $Cl^-$ $Fe^{+++}$ (27.5)

$H_2O + Fe_2O_3 + FeCl_3$

### $Cl^-$ $Fe^{+++}$ $Na^+$

$H_2O + FeCl_3 + NaCl$

$t$ = 21°C (186)

| % $FeCl_3$ | % NaCl |
|---|---|
| NaCl | |
| 0 | 36.10 |
| Solid soln. I | |
| 24.27 | 9.10 |
| 25.40 | 8.45 |
| 26.40 | 5.25 |
| 38.15 | 3.90 |
| 45.38 | 2.45 |
| 46.75 | 2.11 |
| $FeCl_3$ | |
| 83.39 | 0 |

### $Cl^-$ $Fe^{+++}$ $K^+$

$H_2O + FeCl_3 + KCl$

$t$ = 21°C (186)

| % $FeCl_3$ | % KCl |
|---|---|
| KCl | |
| 0 | 34.97 |
| Solid soln. I | |
| 13.44 | 24.45 |
| 23.18 | 16.54 |
| 28.05 | 11.69 |
| 35.72 | 11.68 |

### $Cl^-$ $Fe^{+++}$ $K^+$.—(*Continued*)

| % $FeCl_3$ | % KCl |
|---|---|
| $FeCl_3.2KCl.H_2O$ | |
| 36.62 | 11.19 |
| 37.35 | 13.67 |
| 42.03 | 7.88 |
| 51.69 | 7.54 |
| $FeCl_3$ | |
| 83.89 | 0.0 |

Transformation temperature, $FeCl_3.2KCl.H_2O$ = 22–22.5°C.

### $Cl^-$ $Fe^{+++}$ $Cs^+$

$H_2O + FeCl_3 + CsCl$

$t$ = 21°C (186)

| % CsCl | % $FeCl_3$ |
|---|---|
| CsCl | |
| 65.00 | 0.0 |
| $FeCl_3.3CsCl.H_2O$ | |
| 55.18 | 0.45 |
| 52.38 | 2.01 |
| 51.44 | 5.24 |
| $FeCl_3.2CsCl.H_2O$ | |
| 47.70 | 7.80 |
| 41.15 | 8.93 |
| 25.25 | 15.34 |
| 14.96 | 21.65 |
| 8.42 | 27.96 |
| 0.94 | 48.71 |
| $FeCl_3$ | |
| 0.0 | 83.89 |

Transformation temperature, $FeCl_3.2CsCl.H_2O$=39.5–39.8°C.

### $Cl^-$ $Co^{++}$

$H_2O + HCl + CoCl_2$

$t$ = 0°C (136)

| % $CoCl_2$ | % HCl |
|---|---|
| $CoCl_2.6H_2O$ | |
| 31.66 | 0.0 |
| 25.58 | 3.26 |
| 17.78 | 8.74 |
| 12.79 | 12.44 |
| 5.97 | 19.01 |
| 4.74 | 20.51 |
| 2.69 | 25.66 |
| 3.07 | 27.77 |
| 6.34 | 29.38 |
| 9.91 | 29.15 |
| 11.58 | 28.97 |
| $CoCl_2.6H_2O + CoCl_2.2H_2O$ | |
| 12.65 | 28.99 |
| $CoCl_2.2H_2O$ | |
| 12.66 | 30.27 |
| 15.11 | 33.03 |
| 15.12 | 33.86 |

### $Cl^-$ $Co^{++}$ $Na^+$ (406)

$H_2O + CoCl_2 + NaCl$

### $Cl^-$ $Co^{++}$ $K^+$ (406)

$H_2O + CoCl_2 + KCl$

### $Cl^-$ $Co^{++}$ $Rb^+$ (406)

$H_2O + CoCl_2 + RbCl$

### $Cl^-$ $Co^{++}$ $Cs^+$ (406)

$H_2O + CoCl_2 + CsCl$

### $Cl^-$ $Ni^{++}$

$H_2O + HCl + NiCl_2$

$t$ = 0°C (136)

| % HCl | % $NiCl_2$ |
|---|---|
| $NiCl_2.6H_2O$ | |
| 0.0 | 35.27 |
| 6.53 | 26.71 |
| 14.09 | 15.67 |
| 18.62 | 9.68 |
| 21.70 | 6.15 |
| 23.03 | 5.30 |
| 25.74 | 3.65 |
| 26.16 | 4.02 |
| $NiCl_2.6H_2O + NiCl_2.4H_2O$ | |
| 26.01 | 4.56 |
| $NiCl_2.4H_2O$ | |
| 26.23 | 4.45 |
| 28.82 | 2.92 |
| 34.57 | 1.37 |
| $NiCl_2.4H_2O + NiCl_2.2H_2O$ | |
| 35.03 | 1.40 |
| $NiCl_2.2H_2O$ | |
| 36.00 | 1.06 |
| 37.22 | 0.82 |
| 40.61 | 0.43 |

### $Cl^-$ $U_2O_4^{--}$ $Na^+$

$H_2O + NaCl + Na_2U_2O_4$

$t$ = 37°C (1)

| g NaCl/l | g $Na_2U_2O_4$/l |
|---|---|
| NaCl | |
| 0.284 | 1.866 |
| 0.277 | 1.184 |

### $Cl^-$ $U_2O_4^{--}$ $Na^+$.—(*Cont'd*)

| g NaCl/l | g $Na_2U_2O_4$/l |
|---|---|
| NaCl | |
| 0.310 | 1.170 |
| 0.505 | 1.117 |
| 0.633 | 0.891 |
| 0.817 | 0.734 |
| 1.498 | 0.599 |
| 2.345 | 0.355 |
| 2.991 | 0.188 |
| 3.897 | 0.174 |
| 4.304 | 0.118 |
| 5.025 | 0.090 |

### $Cl^-$ $BO_3^{---}$

$H_2O + HCl + H_3BO_3$

$t$ = 26°C (175)

| $M_{HCl}$/l | $M_{H_3BO_3}$/l |
|---|---|
| $H_3BO_3$ | |
| 0.0 | 0.907 |
| 0.130 | 0.895 |
| 0.260 | 0.870 |
| 0.390 | 0.842 |
| 1.30 | 0.645 |
| 2.16 | 0.542 |
| 4.32 | 0.308 |
| 6.00 | 0.338 |
| 7.08 | 0.327 |
| 8.74 | 0.327 |
| 9.51 | 0.338 |

### $Cl^-$ $B_4O_7^{--}$ $Na^+$ (329): $H_2O + NaCl + Na_2B_4O_7$

| Solid phases | Liquid phase | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 10°C | | $t$ = 25°C | |
| | % NaCl | % $Na_2B_4O_7$ | % NaCl | % $Na_2B_4O_7$ | % NaCl | % $Na_2B_4O_7$ |
| NaCl | 26.20 | | 26.32 | | 26.43 | |
| NaCl + $Na_2B_4O_7.10H_2O$ | 25.88 | 0.35 | 26.08 | 0.40 | 26.04 | 0.74 |
| $Na_2B_4O_7.10H_2O$ | | 1.09 | | 1.59 | | 3.08 |

### $Cl^-$ $Al^{+++}$ (410): HCl + $AlCl_3$

### $Cl^-$ $Al^{+++}$ $K^+$ (409): $H_2O + AlCl_3 + KCl$

### $Cl^-$ $Mg^{++}$ (252): $H_2O + MgO + MgCl_2$

| Solid phases* | Liquid phase: % $MgCl_2$ |
|---|---|
| $MgO.H_2O + 3MgO.MgCl_2.12H_2O$ | 14.01 |
| $3MgO.MgCl_2.12H_2O + MgCl_2.6H_2O$ | 37.00 |

* These investigators (252) found the solid $MgO.H_2O$ to exist as a metastable phase in solutions containing from 14.01 to 20.95 % $MgCl_2$, also the solid $3MgO.MgCl_2.12H_2O$ as a metastable phase in solutions from 12.45 to 14.01 % $MgCl_2$. Robinson and Waggaman (315) had reported a solid solution composed of MgO and $MgCl_2$ in addition to solid $3MgO.MgCl_2.12H_2O$.

### $Cl^-$ $Mg^{++}$ $Ca^{++}$: $H_2O + MgCl_2 + CaCl_2$; *v.* Fig. 64

$t$ = 25°C (244)

| | Solid phases | Liquid phase: % $CaCl_2$ | Liquid phase: % $MgCl_2$ |
|---|---|---|---|
| A | $CaCl_2.6H_2O$ | 45.06 | |
| B | $CaCl_2.6H_2O + CaCl_2.2MgCl_2.12H_2O$ | 38.70 | 9.43 |

**$Cl^-$ $Mg^{++}$ $Ca^{++}$.—(*Continued*)**

| | Solid phases | Liquid phase: % $CaCl_2$ | Liquid phase: % $MgCl_2$ |
|---|---|---|---|
| C | $CaCl_2.2MgCl_2.12H_2O$ + $MgCl_2.6H_2O$ | 31.17 | 14.54 |
| D | $MgCl_2.6H_2O$ | 16.05 | 23.33 |
| E | $MgCl_2.6H_2O$ | | 35.54 |
| °C | (198) | | |
| 16.7 | $CaCl_2.6H_2O$ | 41.7 | |
| 16.7 | $CaCl_2.6H_2O$ + $MgCl_2.6H_2O$ | 23.89 | 18.20 |
| 16.7 | $MgCl_2.6H_2O$ | | 35.27 |
| 22 | $MgCl_2.6H_2O$ + $2MgCl_2.CaCl_2.12H_2O$ + $CaCl_2.6H_2O$ | 31.20 | 14.21 |
| 25 | $CaCl_2.6H_2O$ + $CaCl_2.4H_2O$ + $2MgCl_2.CaCl_2.12H_2O$ | 38.31 | 9.38 |
| 28.2 | $MgCl_2.6H_2O$ + $2MgCl_2.CaCl_2.12H_2O$ | 29.80 | 15.53 |
| 28.2 | $CaCl_2.4H_2O$ + $2MgCl_2.CaCl_2.12H_2O$ | 42.02 | 5.55 |
| 29.4 | $CaCl_2.6H_2O$ + $CaCl_2.4H_2O$ | 49.19 | |
| 32 | $CaCl_2.4H_2O$ | 50.47 | |
| 32 | $MgCl_2.6H_2O$ | | 37.21 |

**$Cl^-$ $Mg^{++}$ $Ca^{++}$ $Na^+$ $K^+$**; *v.* p. 311

**$Cl^-$ $Mg^{++}$ $Na^+$ (36, 97, 192, 257, 375)**
$H_2O$ + $MgCl_2$ + NaCl

| Solid phases | Liquid phase: $t$ = 0°C (36, 375) % $MgCl_2$ | % NaCl | $t$ = 25°C (36, 375) % $MgCl_2$ | % NaCl | $t$ = 105°C (257) % $MgCl_2$ | % NaCl |
|---|---|---|---|---|---|---|
| $MgCl_2.6H_2O$ | 34.55 | | 35.47 | | 42.78 | |
| $MgCl_2.6H_2O$ + NaCl | 33.90 | 0.72 | 35.80 | 0.21 | 42.78 | Tr. |
| | 27.95 | 1.47 | 29.92 | 1.12 | 37.14 | 0.84 |
| | 19.34 | 6.19 | 24.40 | 4.11 | 34.55 | 1.16 |
| | 15.16 | 9.77 | 20.00 | 6.01 | 27.82 | 3.74 |
| | 7.48 | 17.93 | 16.84 | 8.79 | 26.69 | 4.17 |
| NaCl | | | 10.22 | 15.01 | 22.51 | 6.67 |
| | | | 5.95 | 19.50 | 13.09 | 14.44 |
| | | | 2.75 | 23.24 | 6.06 | 21.83 |
| | | 26.29 | | 26.27 | 1.66 | 26.35 |
| | | | | | | 28.29 |

Invariant points (97, 192)

$MgCl_2.6H_2O$ + $MgCl_2.4H_2O$ + NaCl + Solution (45.34% $MgCl_2$, 0.38% NaCl) at 116.16°C.

$MgCl_2.6H_2O$ + $MgCl_2.4H_2O$ + Solution at 116.67°C.

**$Cl^-$ $Mg^{++}$ $Na^+$ $K^+$ (97, 189)**: $H_2O$ + $MgCl_2$ + NaCl + KCl

| °C | Solid phases | Liquid phase: % $MgCl_2$ | % KCl | % NaCl |
|---|---|---|---|---|
| 0 | $MgCl_2.6H_2O$ + $MgCl_2.KCl.6H_2O$ + NaCl | 34.24 | 0.05 | 0.34 |
| 0 | $MgCl_2.KCl.6H_2O$ + NaCl + KCl | 25.42 | 1.18 | 1.85 |
| 25 | $MgCl_2.6H_2O$ + $MgCl_2.KCl.6H_2O$ + NaCl | 35.26 | 0.08 | 0.41 |
| 25 | $MgCl_2.KCl.6H_2O$ + NaCl + KCl | 26.44 | 1.68 | 0.87 |
| 55 | $MgCl_2.KCl.6H_2O$ + $MgCl_2.6H_2O$ + NaCl | 37.47 | 0.13 | 0.28 |
| 55 | $MgCl_2.KCl.6H_2O$ + KCl + NaCl | 28.08 | 2.36 | 1.67 |
| 83 | $MgCl_2.KCl.6H_2O$ + $MgCl_2.6H_2O$ + NaCl | 36.90 | 0.43 | 0.73 |
| 83 | $MgCl_2.KCl.6H_2O$ + KCl + NaCl | 31.66 | 2.69 | 0.55 |

**$Cl^-$ $Mg^{++}$ $K^+$ (97, 105, 155, 202, 244, 248)**
$H_2O$ + $MgCl_2$ + KCl; *v.* Fig. 65

| | °C | Solid phases (202) | Liquid phase: % $MgCl_2$ | % KCl |
|---|---|---|---|---|
| B | − 33.6 | $MgCl_2.12H_2O$ + Ice | 20.64 | |
| C | − 16.9 | $MgCl_2.12H_2O$ + $MgCl_2.8H_2O$ | 31.64 | |
| D | − 3.4 | $MgCl_2.8H_2O$ + $MgCl_2.6H_2O$ | 34.37 | |
| E | 116.67 | $MgCl_2.6H_2O$ + $MgCl_2.4H_2O$ | 46.12 | |
| F | 181 | $MgCl_2.4H_2O$ + $MgCl_2.2H_2O$ | 55.74 | |
| G | 186 | $MgCl_2.2H_2O$ | 56.05 | |
| H | 186 | $MgCl_2.2H_2O$ + KCl | 50.17 | 10.31 |
| I | 186 | KCl | | 44.76 |
| J | − 11.1 | KCl + Ice | | 19.74 |
| K | − 34.3 | KCl + $MgCl_2.12H_2O$ + Ice | 18.34 | 1.00 |
| P | − 21 | $MgCl_2.12H_2O$ + $MgCl_2.KCl.6H_2O$ + KCl | 25.53 | 1.48 |
| Q | 61.5 | $MgCl_2.KCl.6H_2O$ + KCl | 28.46 | 4.80 |
| R | 167.5 | $MgCl_2.KCl.6H_2O$ + KCl | 42.93 | 8.41 |
| S | 152.5 | $MgCl_2.KCl.6H_2O$ + $MgCl_2.4H_2O$ + KCl | 49.04 | 4.61 |
| T | 176 | $MgCl_2.4H_2O$ + $MgCl_2.2H_2O$ + KCl | 52.05 | 6.96 |
| U | 115.70 | $MgCl_2.KCl.6H_2O$ + $MgCl_2.6H_2O$ + $MgCl_2.4H_2O$ | 45.74 | 0.88 |
| | 25°C (244) | $MgCl_2.6H_2O$ | 35.54 | |
| | | $MgCl_2.6H_2O$ + $MgCl_2.KCl.6H_2O$ | 35.47 | 0.52 |
| | | $MgCl_2.KCl.6H_2O$ + KCl | 26.66 | 3.19 |
| | | KCl | 12.11 | 13.56 |
| | | | | 26.74 |

**$Cl^-$ $Ca^{++}$**; *v. also* p. 311
$H_2O$ + HCl + $CaCl_2$

$t$ = 25°C (271)

| % $CaCl_2$ | % HCl |
|---|---|
| $CaCl_2.6H_2O$ | |
| 44.77 | 0.0 |
| 43.59 | 1.92 |
| 43.71 | 2.96 |
| $CaCl_2.6H_2O$ + $CaCl_2.4H_2O$ | |
| 44.50 | 3.33 |
| $CaCl_2.4H_2O$ | |
| 43.10 | 5.03 |
| 38.49 | 9.17 |
| 36.66 | 10.78 |
| 34.43 | 12.75 |
| 27.94 | 20.48 |
| $CaCl_2.4H_2O$ + $CaCl_2.2H_2O$ | |
| 28.52* | 21.40* |
| $CaCl_2.2H_2O$ | |
| 27.81 | 21.83 |

* Mean of three results.

**$Cl^-$ $Ca^{++}$ $Na^+$**; *v.* p. 312

**$Cl^-$ $Ca^{++}$ $K^+$**; *v. also* p. 312
$H_2O$ + $CaCl_2$ + KCl
$t$ = 25°C (244)

| % $CaCl_2$ | % KCl |
|---|---|
| $CaCl_2.6H_2O$ | |
| 45.06 | 0.0 |
| $CaCl_2.6H_2O$ + KCl | |
| 44.66 | 3.05 |
| KCl | |
| 16.55 | 11.64 |
| 0.0 | 26.74 |

**$Cl^-$ $Sr^{++}$**; *v. also* p. 311
$H_2O$ + HCl + $SrCl_2$
$t$ = 25°C (271)

| % $SrCl_2$ | % HCl |
|---|---|
| $SrCl_2.6H_2O$ | |
| 35.60 | 0.0 |
| 33.97 | 0.66 |
| 27.55 | 4.57 |
| 9.86 | 16.12 |
| 6.68 | 18.89 |
| $SrCl_2.6H_2O$ + $SrCl_2.2H_2O$ | |
| 2.11 | 27.14 |
| $SrCl_2.2H_2O$ | |
| 1.29 | 28.23 |
| 0.13 | 37.66 |

**$Cl^-$ $Sr^{++}$ $K^+$**; *v.* p. 312

**$Cl^-$ $Mg^{++}$ $Ca^{++}$ $Na^+$ $K^+$ (191, 199): $H_2O + MgCl_2 + CaCl_2 + NaCl + KCl$**

| Solid phases | Liquid phase—M per 1000M $H_2O$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t$ = 25°C | | | | $t$ = 83°C | | | |
| | 0.5 $CaCl_2$ | 0.5 $MgCl_2$ | KCl | NaCl | 0.5 $CaCl_2$ | 0.5 $MgCl_2$ | KCl | NaCl |
| $NaCl + CaCl_2.6H_2O$ | 266 | | | 2 | | | | 1 |
| $NaCl + CaCl_2.2H_2O$ | | | | | 478 | | | |
| $NaCl + MgCl_2.6H_2O$ | | 212 | | 2 | | | | |
| $MgCl_2.6H_2O + Mg_2CaCl_6.12H_2O$ | 181 | 103 | | 2 | | | | |
| $NaCl + KCl$ | | | 39 | 89 | | | | |
| $NaCl + Mg_2CaCl_6.12H_2O + MgCl_2.6H_2O$ | | | | | 282 | 91 | | 1 |
| $NaCl + NaCl_2.2H_2O + KCl$ | | | | | 498 | | 22 | 1 |
| $NaCl + KCl + CaCl_2.6H_2O$ | 292 | | 22 | 2 | | | | |
| $NaCl + MgCl_2.6H_2O + MgCl_2.KCl.6H_2O$ | | 210 | 1 | 2 | | | | |
| $NaCl + MgCl_2.KCl.6H_2O + KCl$ | | 141 | 11 | 4 | | | | |
| $NaCl + MgCl_2.KCl.6H_2O + KCl + CaCl_2.6H_2O$ | 183 | 10 | 19 | 2 | | | | |
| $NaCl + Mg_2CaCl_6.12H_2O + CaCl_2.6H_2O$ | 243 | 71 | | 2 | | | | |
| $NaCl + CaCl_2.2H_2O + Mg_2CaCl_6.12H_2O$ | | | | | 478 | | | 1 |
| $NaCl + Mg_2CaCl_6.12H_2O + MgCl_2.6H_2O + MgCl_2.KCl.6H_2O$ | 181 | 103 | | 2 | 282 | 91 | | 1 |
| $NaCl + CaCl_2.2H_2O + KCl + MgCl_2.KCl.6H_2O$ | | | | | 432 | 54 | 21 | 1 |
| $NaCl + Mg_2CaCl_6.12H_2O + CaCl_2.6H_2O + MgCl_2.KCl.6H_2O$ | 243 | 69 | 4 | 2 | | | | |
| $NaCl + Mg_2CaCl_6.12H_2O + CaCl_2.2H_2O + MgCl_2.KCl.6H_2O$ | | | | | 478 | | | 1 |

**$Cl^-$ $Ca^{++}$ (270, 271): $H_2O + HCl + Ca(OH)_2$; *v.* Fig. 66 and p. 310**

| | Solid phases | Liquid phase | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 25°C (271) | | $t$ = 10°C (270) | | $t$ = 25°C (270) | | $t$ = 40°C (270) | | $t$ = 45°C (270) | | $t$ = 50°C (270) | |
| | | % CaO | % HCl | % CaO | % $CaCl_2$ | % CaO | % $CaCl_2$ | % CaO | % $CaCl_2$ | % CaO | % $CaCl_2$ | % CaO | % $CaCl_2$ |
| A | $CaO.H_2O$ | 2.64 | 3.30 | 0.13 | | 0.101 | 5.02 | 0.104 | | 0.10 | | 0.096 | |
| | | 6.66 | 8.50 | | | | | | | | | | |
| | $CaO.H_2O + CaO.CaCl_2.2H_2O$ | | | | | | | 0.587† | 31.90† | 0.628† | 31.84† | | |
| B | $CaO.H_2O + 3CaO.CaCl_2.16H_2O$ | 9.29* | 11.89* | 0.102* | 15.34* | 0.150* | 18.08* | | | | | | |
| | $3CaO.CaCl_2.16H_2O$ | 12.44 | 15.99 | | | | | | | | | | |
| | | 15.10 | 19.41 | 0.115 | 32.38 | 0.170 | 28.37 | | | | | | |
| C | $3CaO.CaCl_2.16H_2O + CaO.CaCl_2.2H_2O$ | 17.15* | 21.99* | 0.151* | 35.94* | 0.250* | 33.46* | | | | | | |
| | $CaO.CaCl_2.2H_2O$ | 20.92 | 27.15 | 0.106 | 38.23 | 0.06 | 38.61 | 0.055 | 49.97 | | | | |
| D | $CaO.CaCl_2.2H_2O + CaCl_2.6H_2O$ | 22.56* | 29.31* | | | 0.022 | 44.51 | | | | | | |
| | $CaCl_2.6H_2O$ | 22.02 | 30.57 | | | | | | | | | | |
| E | $CaCl_2.6H_2O + CaCl_2.4H_2O$ | 22.48 | 32.57 | | | | | | | | | | |
| | $CaCl_2.4H_2O$ | 17.39 | 35.38 | | | | | | 51.18 | | | | |
| F | $CaCl_2.4H_2O + CaCl_2.2H_2O$ | 14.40* | 40.08* | | | | | | | | | | |
| | $CaCl_2.2H_2O$ | 14.05 | 40.10 | | | | | | | | 57.19 | | 56.96 |
| | $CaO.H_2O + CaO.CaCl_2.5(4)H_2O$ | | | | | | | | | | | 0.362 | 29.66 |
| | $CaO.CaCl_2.5(4)H_2O + CaO.CaCl_2.2H_2O$ | | | | | | | | | | | 0.130† | 36.88† |
| | $CaO.CaCl_2.2H_2O + CaCl_2.2H_2O$ | | | | | | | | | 0.121 | 56.96 | 0.058† | 54.05† |

* Mean of two results. † Mean of two or more results.

**$Cl^-$ $Ca^{++}$ $Na^+$; $Cl^-$ $Ca^{++}$ $K^+$; *v.* p. 312**

**$Cl^-$ $Sr^{++}$ (270, 271): $H_2O + HCl + Sr(OH)_2$; *v.* Fig. 67 and p. 310**

| | Solid phases | Liquid phase | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 25°C (271) | | $t$ = 0°C (270) | | $t$ = 25°C (270) | | $t$ = 40°C (270) | |
| | | % HCl | % SrO | % SrO | % $SrCl_2$ | % SrO | % $SrCl_2$ | % SrO | % $SrCl_2$ |
| A | $SrO.9H_2O$ | | 0.85 | 0.35 | | 0.85 | | 1.48 | |
| B | $SrO.9H_2O + SrO.SrCl_2.9H_2O$ | 15.37 | 22.94 | | | 1.09 | 33.41 | 2.49 | 32.07 |
| | $SrO.9H_2O + SrCl_2.6H_2O$ | | | 0.31 | 30.58 | | | | |
| C | $SrO.SrCl_2.9H_2O + SrCl_2.6H_2O$ | 16.40 | 24.15 | | | 0.85 | 35.65 | 1.36 | 39.25 |
| D | $SrCl_2.6H_2O$ | 17.24 | 18.01 | | 30.68 | | 35.60 | | 39.62 |
| E | | 20.66 | 6.44 | | | | | | |
| F | $SrCl_2.6H_2O + SrCl_2.2H_2O$ | 28.16 | 1.38 | | | | | | |
| G | $SrCl_2.2H_2O$ | 37.72 | 0.08 | | | | | | |

**$Cl^-$ $Sr^{++}$ $K^+$; *v.* p. 312**

### $Cl^-$ $Ca^{++}$ $Na^+$ (59, 297)
$H_2O + CaCl_2 + NaCl$

| Solid phases | Liquid phase | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 25°C | | $t$ = 50°C | | $t$ = 94.5°C | |
| | % $CaCl_2$ | % NaCl | % $CaCl_2$ | % NaCl | % $CaCl_2$ | % NaCl |
| $CaCl_2.6H_2O$ | 45.65 | 0 | | | | |
| $CaCl_2.6H_2O$ + NaCl | 43.52 | 1.024 | | | | |
| $CaCl_2.2H_2O$ | | | 57.00 | | 61.0 | |
| $CaCl_2.2H_2O$ + NaCl | | | 56.3 | 0.9 | 58.1 | 0.8 |
| NaCl | 36.52 | 1.022 | 30.9 | 3.60 | 57.4 | 1.1 |
| | 34.43 | 1.158 | 15.10 | 13.2 | 52.7 | 1.2 |
| | 25.45 | 5.37 | 3.3 | 24.4 | 45.7 | 1.3 |
| | 21.37 | 7.60 | 0.0 | 26.8 | 32.8 | 4.3 |
| | 14.11 | 13.62 | | | 16.3 | 14 |
| | 2.87 | 23.81 | | | 15.3 | 15 |
| | 0.0 | 26.36 | | | 11.5 | 18.1 |
| | | | | | 0 | 28.4 |

### $Cl^-$ $Ca^{++}$ $K^+$.—*(Continued from p. 310)*
$H_2O + CaCl_2 + KCl$
$t$ = 30°C (19)

| % $CaCl_2$ | % KCl |
|---|---|
| $CaCl_2.4H_2O\alpha$ | |
| 50.2 | 0.0 |
| $CaCl_2.4H_2O\alpha$ + KCl | |
| 49.20 | 4.40 |
| KCl | |
| 31.83 | 3.90 |
| 13.65 | 14.70 |
| 0.0 | 27.20 |

### $Cl^-$ $Sr^{++}$ $K^+$
$H_2O + SrCl_2 + KCl$
$t$ = 25°C (161)
M per 1000g $H_2O$

| KCl | 0.5$SrCl_2$ |
|---|---|
| $SrCl_2.6H_2O$ | |
| 0.0 | 7.034 |
| 0.0719 | 7.016 |
| 0.433 | 6.950 |
| 0.8576 | 6.882 |
| 1.594 | 6.764 |

### $Cl^-$ $Ba^{++}$
$H_2O + HCl + BaCl_2$
$t$ = 30°C (256)

| % HCl | % $BaCl_2$ |
|---|---|
| $BaCl_2.2H_2O$ | |
| 0.0 | 27.84 |
| 1.36 | 24.17 |
| 3.32 | 19.24 |
| 5.02 | 15.21 |
| 7.13 | 10.80 |
| 10.02 | 5.78 |
| 13.25 | 2.37 |
| 16.93 | 0.38 |
| 20.62 | 0.0 |

### $Cl^-$ $Ba^{++}$ $Li^+$
$H_2O + Ba(OH)_2 + LiCl$
$t$ = 25°C (176)

| $M_{Cl^-}$/l | $M_{OH^-}$/l |
|---|---|
| $Ba(OH)_2.8H_2O$ | |
| 2.30 | 1.336 |
| 1.42 | 0.937 |
| 0.75 | 0.745 |
| 0.0 | 0.555 |

### $Cl^-$ $Ba^{++}$ (271, 339)
$H_2O + HCl + Ba(OH)_2$; *v.* Fig. 68

| | Solid phases | Liquid phase | | | |
|---|---|---|---|---|---|
| | | $t$ = 25°C (271) | | $t$ = 30°C (339) | |
| | | % BaO | % HCl | % $BaCl_2$ | % BaO |
| A | $BaO.9H_2O$ | 4.99 | 0 | 0 | 4.99 |
| | | | | 10.77 | 4.45 |
| | | | | 17.08 | 4.60 |
| B | $BaO.9H_2O$ + $BaO.BaCl_2.5H_2O$ | 18.36 | 6.53 | | |
| | $Ba(OH)Cl.2H_2O$ + $BaO.9H_2O$ | | | 18.67 | 4.61 |
| | $Ba(OH)Cl.2H_2O$ | | | 21.46 | 3.27 |
| | | | | 24.98 | 2.33 |
| | $Ba(OH)Cl.2H_2O$ + $BaCl_2.2H_2O$ | | | 27.36 | 1.77 |
| C | $BaO.BaCl_2.5H_2O$ + $BaCl_2.2H_2O$ | 21.92 | 9.58 | | |
| D | $BaCl_2.2H_2O$ | 18.21 | 9.66 | | |
| | | 2.83 | 12.90 | | |
| E | $BaCl_2.2H_2O$ + $BaCl_2.H_2O$ | 0 | 37.34 | | |
| F | $BaCl_2.2H_2O$ | 0 | 38.63 | 27.42 | 1.78 |
| | | | | 27.60 | 0 |

### $Cl^-$ $Ba^{++}$ $Na^+$
$H_2O + BaCl_2 + Na_2O$; *v.* Fig. 69; $t$ = 30°C (339)

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | 0.5 $BaCl_2$ | 0.5 BaO | NaCl | 0.5 $Na_2O$ |
| A | NaCl | | | 110.94 | |
| B | NaCl + $NaOH.H_2O$ | | | 5.18 | 417.36 |
| C | $NaOH.H_2O$ | | | | 420.83 |
| D | $NaOH.H_2O$ + $BaO.2H_2O$ | | 2.29 | | 409.33 |
| E | $BaO.2H_2O$ + $BaO.4H_2O$ | | 4.53 | | 244.47 |
| F | $BaO.4H_2O$ + $BaO.9H_2O$ | | 5.97 | | 194.74 |
| G | $BaO.9H_2O$ | | 12.33 | | |
| H | $BaO.9H_2O$ + $Ba(OH)Cl.2H_2O$ | 42.04 | 15.00 | | |
| I | $Ba(OH)Cl.2H_2O$ + $BaCl_2.2H_2O$ | 66.72 | 5.87 | | |
| J | $BaCl_2.2H_2O$ | 65.93 | | | |
| K | $BaCl_2.2H_2O$ + NaCl | 9.07 | | 100.95 | |
| P | $BaCl_2.2H_2O$ + NaCl + $Ba(OH)Cl.2H_2O$ | 5.61 | 5.84 | 105.89 | |
| Q | $Ba(OH)Cl.2H_2O$ + NaCl + $BaO.9H_2O$ | | 3.64 | 74.80 | 58.44 |
| R | NaCl + $BaO.9H_2O$ + $BaO.4H_2O$ | | 7.31 | 19.84 | 187.55 |
| S | NaCl + $BaO.4H_2O$ + $BaO.2H_2O$ | | 5.73 | 12.39 | 229.84 |
| T | $BaO.2H_2O$ + NaCl + $NaOH.H_2O$ | | 0.48 | 5.46 | 409.10 |

### $Cl^-$ $Ba^{++}$ $Na^+$
$H_2O + HCl + BaO + Na_2O$; *v.* Fig. 70; $t$ = 30°C (339)

| | Solid phases | Liquid phase | | |
|---|---|---|---|---|
| | | % BaO | % HCl | % $Na_2O$ |
| A | $BaO.9H_2O$ | 4.99 | | |
| B | $BaO.4H_2O$ + $BaO.9H_2O$ | 1.87 | | 24.63 |
| C | $BaO.2H_2O$ + $BaO.4H_2O$ | 1.34 | | 29.24 |
| D | $NaOH.H_2O$ + $BaO.2H_2O$ | 0.57 | | 41.08 |
| E | $NaOH.H_2O$ | | | 42.0*ca.* |
| F | NaCl + $NaOH.H_2O$ | | 0.61 | 41.94 |
| G | NaCl | | 16.51 | 14.04 |
| H | | | 19.21 | 4.92 |
| I | | | 35.45 | 0.60 |
| J | $BaCl_2.2H_2O$ + $BaCl_2.H_2O$ | | 38.77 | |
| K | $BaCl_2.2H_2O$ | 2.85 | 12.91 | |
| L | | 20.33 | 9.67 | |
| M | $Ba(OH)Cl.2H_2O$ + $BaCl_2.2H_2O$ | 21.92 | 9.58 | |
| N | $BaO.9H_2O$ + $Ba(OH)Cl.2H_2O$ | 18.35 | 6.53 | |
| P | NaCl + $BaCl_2.2H_2O$ | 2.79 | 16.20 | 12.64 |
| Q | NaCl + $BaCl_2.2H_2O$ + $Ba(OH)Cl.2H_2O$ | 3.48 | 16.12 | 13.10 |
| R | NaCl + $Ba(OH)Cl.2H_2O$ + $BaO.9H_2O$ | 1.14 | 11.15 | 16.89 |
| S | NaCl + $BaO.9H_2O$ + $BaO.4H_2O$ | 2.20 | 2.83 | 25.18 |
| T | NaCl + $BaO.4H_2O$ + $BaO.2H_2O$ | 1.25 | 1.72 | 28.56 |
| U | NaCl + $BaO.2H_2O$ + $NaOH.H_2O$ | 0.11 | 0.61 | 39.47 |

### $Cl^-$ $Ba^{++}$ $Na^+$ (126, 303, 347)
$H_2O + BaCl_2 + NaCl$

| Solid phases | Liquid phase | | | |
|---|---|---|---|---|
| | $t$ = 20°C (126) | | $t$ = 30°C (347) | |
| | % $BaCl_2$ | % NaCl | % $BaCl_2$ | % NaCl |
| $BaCl_2.2H_2O$ | 16.89 | 7.80 | | 26.47 |
| | 10.04 | 14.50 | 2.28 | 25.28 |
| | 6.51 | 18.52 | | |
| | 4.17 | 21.23 | | |
| $BaCl_2.2H_2O$ + NaCl | 3.07 | 24.59 | 3.80 | 23.84 |
| NaCl | 1.65 | 25.28 | 2.28 | 25.28 |
| | | | | 26.47 |

**$Cl^- Ba^{++} Na^+$.—(*Continued*)**

$H_2O + BaCl_2 + NaCl$

| °C (303) | % $BaCl_2$ | % NaCl |
|---|---|---|
| | NaCl + $BaCl_2.2H_2O$* | |
| 10 | 2.5 | 24.8 |
| 20 | 3.0 | 24.5 |
| 30 | 3.6 | 24.3 |
| 40 | 4.5 | 24.0 |
| 50 | 5.5 | 23.7 |
| 60 | 6.7 | 23.4 |
| 70 | 8.1 | 23.1 |
| 80 | 9.4 | 22.8 |
| 90 | 10.6 | 22.5 |
| 100 | 11.8 | 22.2 |

* Solid phases not determined after saturation; those given are probable.

**$Cl^- Ba^{++} Na^+$**

$H_2O + HCl + BaCl_2 + NaCl$

$t$ = 30°C (339)

| % $BaCl_2$ | % HCl | % NaCl |
|---|---|---|
| | $BaCl_2.2H_2O$ | |
| 26.70 | | |
| | NaCl | |
| | | 26.47 |
| | $BaCl_2.2H_2O$ + NaCl | |
| 3.80 | | 23.84 |
| 2.27 | 4.84 | 18.07 |
| 0.82 | 12.02 | 9.55 |
| 0.29 | 17.20 | 4.65 |
| | 23.16 | 1.54 |
| | 28.66 | 0.47 |
| | 36.51 | 0.12 |

**$Cl^- Ba^{++} Na^+$**

$H_2O + Ba(OH)_2 + NaCl$

$t$ = 25°C (176)

| $M_{Cl^-}$/l | $M_{OH^-}$/l |
|---|---|
| | $Ba(OH)_2.8H_2O$ |
| 2.82 | 0.806 |
| 1.43 | 0.699 |
| 0.73 | 0.63 |
| 0.0 | 5.55 |

**$Cl^- Ba^{++} K^+$**

$H_2O + Ba(OH)_2 + KCl$

$t$ = 25°C (176)

| $M_{Cl^-}$/l | $M_{OH^-}$/l |
|---|---|
| | $Ba(OH)_2.8H_2O$ |
| 3.40 | 0.676 |
| 1.75 | 0.660 |
| 0.86 | 0.645 |
| 0.0 | 0.555 |

**$Cl^- Ba^{++} K^+$** (350)

$H_2O + BaCl_2 + KCl$

| Solid phases | Liquid phase—g per 100g $H_2O$ | | | |
|---|---|---|---|---|
| | $t$ = 40°C | | $t$ = 60°C | |
| | $BaCl_2$ | KCl | $BaCl_2$ | KCl |
| $BaCl_2.2H_2O$ | 28.98 | | 31.70 | |
| $BaCl_2.2H_2O$ + KCl | 9.15 | 23.98 | 14.83 | 23.09 |
| KCl | | 28.63 | | 31.20 |

**$Cl^- Ba^{++} Rb^+$**

$H_2O + Ba(OH)_2 + RbCl$

$t$ = 25°C (176)

| $M_{Cl^-}$/l | $M_{OH^-}$/l |
|---|---|
| | $Ba(OH)_2.8H_2O$ |
| 1.25 | 0.648 |
| 0.0 | 0.555 |

**$Cl^- Li^+$**

$H_2O + HCl + LiCl$

$t$ = 25°C (179)

| $M_{HCl}$/l | $M_{LiCl}$/l |
|---|---|
| | $LiCl.H_2O$ |
| 0.0 | 13.536 |
| 0.63 | 13.414 |
| 1.053 | 12.652 |
| 1.764 | 12.258 |

**$Cl^- Li^+ Na^+$**

$H_2O + LiCl + NaCl$

$t$ = 25°C (364)

| % LiCl | % NaCl |
|---|---|
| | $LiCl.H_2O$ |
| 45.8 | 0.0 |
| | $LiCl.H_2O$ + NaCl |
| 45.5 | 0.5 |
| | NaCl |
| 41.3 | 0.4 |
| 40.1 | 0.2 |
| 36.8 | 0.3 |

**$Cl^- Li^+ Na^+$.—(*Continued*)**

| % LiCl | % NaCl |
|---|---|
| | NaCl |
| 35.7 | 0.3 |
| 33.5 | 0.35 |
| 31.6 | 0.8 |
| 24.9 | 2.3 |
| 17.4 | 7.3 |
| 16.9 | 8.4 |
| 6.5 | 19.0 |
| 0 | 26.4 |

The work of Zhemchuzhnui and Rambach (402) had shown that LiCl and NaCl gave a continuous melting-point curve, and that the heat liberated when melts of these components were cooled, was at a maximum corresponding to 2LiCl.NaCl. The above work was designed to ascertain whether the maximum was due to the formation of the compound indicated or to the resolution of the solid solution into its component salts. Authors (364) conclude, chiefly from study of cooled mixtures by X-rays, that it was due to the last-named cause.

**$Cl^- Na^+$**; *v. also* p. 314

$H_2O + HCl + Na_2O$

g per 100g $H_2O$ (14)

| $t$ = 0°C | | $t$ = 25°C | |
|---|---|---|---|
| HCl | NaCl | HCl | NaCl |
| | | NaCl | |
| 0.0 | 35.775 | 0.0 | 36.080 |
| 0.9116 | 34.170 | 0.9116 | 34.450 |
| 1.8233 | 32.445 | 1.8233 | 32.905 |
| 3.6465 | 29.120 | 3.6465 | 29.810 |

$t$ = 25°C (179)

| $M_{HCl}$/l | $M_{NaCl}$/l |
|---|---|
| | NaCl |
| 0.0 | 5.456 |
| 0.607 | 4.850 |
| 1.032 | 4.467 |
| 1.590 | 3.782 |
| 2.117 | 3.297 |
| 3.283 | 2.343 |

$t$ = 30°C (339)

| % HCl | % $Na_2O$ |
|---|---|
| | NaCl |
| 35.65 | 0.06 |
| 20.16 | 2 40 |
| 18.33 | 4.96 |
| 17.01 | 8.58 |
| 16.50 | 14.05 |
| 13.39 | 15.87 |
| 8.49 | 19.45 |
| 2.72 | 26.79 |

**$Cl^- Na^+$.—(*Continued*)**

| % HCl | % $Na_2O$ |
|---|---|
| | NaCl |
| 1.50 | 30.58 |
| 0.70 | 38.44 |
| | NaCl + NaOH.$H_2O$ |
| 0.61 | 41.94 |
| | NaOH.$H_2O$ |
| 0 | 42.0 |

$t$ = 30°C (256)

| % HCl | % NaCl |
|---|---|
| | NaCl |
| 0.00 | 26.27 |
| 1.40 | 24.21 |
| 2.99 | 21.73 |
| 5.60 | 18.03 |
| 7.63 | 15.12 |
| 9.73 | 12.60 |
| 13.41 | 8.42 |
| 19.38 | 3.29 |
| 23.33 | 1.39 |

**$Cl^- Na^+ K^+$**; *v. also* p. 314

$H_2O + HCl + NaCl + KCl$

$t$ = 25°C (183)

| % HCl | % KCl | % NaCl |
|---|---|---|
| | KCl + NaCl | |
| 0 | 10.90 | 19.95 |
| 8.61 | 7.58 | 10.65 |
| 17.16 | 3.80 | 3.56 |
| 20.65 | 2.86 | 2.03 |
| 32.78 | 1.27 | 0.18 |

**$Cl^- K^+$** (14, 179); *cf.* (410): $H_2O + HCl + KCl$

| g per 100g $H_2O$ | | | | M per liter | |
|---|---|---|---|---|---|
| $t$ = 0°C | | $t$ = 25°C | | $t$ = 25°C (179) | |
| HCl | KCl | HCl | KCl | HCl | KCl |
| | KCl | | | KCl | |
| 0.0 | 28.355 | 0.0 | 35.925 | 0.000 | 4.272 |
| 0.9116 | 26.725 | 0.9116 | 34.155 | 0.566 | 3.749 |
| 1.8223 | 25.000 | 1.8223 | 32.430 | 1.020 | 3.379 |
| 3.6465 | 21.425 | 3.6465 | 28.960 | 1.590 | 2.868 |
| | | | | 2.094 | 2.474 |
| | | | | 3.252 | 1.739 |

**$Cl^- K^+$**

$H_2O + KOH + KCl$

$t$ = 20°C (49)

| $M_{KOH}$/l | $M_{KCl}$/l |
|---|---|
| | KCl |
| 4.71 | 1.605 |
| 7.90 | 0.712 |
| 9.41 | 0.405 |
| 10.95 | 0.273 |
| 11.10 | 0.253 |
| 12.19 | 0.191 |
| 12.92 | 0.168 |
| 13.84 | 0.138 |
| 14.02 | 0.136 |
| 14.85 | 0.121 |
| 15.02 | 0.118 |

**$ClO_3^- SO_4^{--} Tl^+$**

$H_2O + TlClO_3 + Tl_2SO_4$

$t$ = 20°C (281)

| g $TlClO_3$/l | g $Tl_2SO_4$/l |
|---|---|
| | $TlClC_3$ |
| 38.51 | 0 |
| | $TlClO_3 + Tl_2SO_4$ |
| 30.40 | 34.43 |
| | $Tl_2SO_4$ |
| 0 | 48.59 |

**$ClO_3^- SO_4^{--} Ca^{++} K^+$**

$H_2O + Ca(ClO_3)_2 + K_2SO_4$

$t$ = 25°C (94)

M per 1000M $H_2O$

| $K_2SO_4$ | $CaSO_4$ | $KClO_3$ |
|---|---|---|
| $CaSO_4.2H_2O$ + $CaSO_4.K_2SO_4.H_2O$ + $KClO_3$ | | |
| 1.03 | 0.454 | 12.27 |

**$Cl^-$ $Na^+$** (14, 141, 179, 256, 339)

$H_2O + HCl + Na_2O$; *v. also* p. 313, and, for more recent data on this system, *v.* (6.5)

| Solid phases (141) | Liquid phase (141) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 15°C | | $t$ = 20°C | | $t$ = 25°C | | $t$ = 30°C | | $t$ = 35°C | | $t$ = 45°C | | $t$ = 60°C | |
| | % NaCl | % NaOH | % NaCl | % NaOH | % NaCl | % NaOH | % NaCl | % NaOH | % NaCl | % NaOH | % NaCl | % NaOH | % NaCl | % NaOH | % NaCl | % NaOH |
| | 26.3 | 0.0 | 26.3 | 0.0 | 26.4 | 0.0 | 26.4 | 0.0 | 26.5 | 0.0 | 26.6 | 0.0 | 26.7 | 0.0 | 27.0 | 0.0 |
| | 19.8 | 7.4 | 15.7 | 12.8 | 14.9 | 14.0 | 14.7 | 14.2 | 14.7 | 14.4 | 14.6 | 14.6 | 15.2 | 14.0 | 14.2 | 15.8 |
| NaCl | 12.2 | 17.2 | 8.3 | 23.1 | 6.6 | 26.1 | 6.5 | 26.6 | 6.4 | 26.9 | 5.8 | 28.4 | 5.9 | 28.7 | 6.6 | 28.3 |
| | 4.6 | 29.4 | 1.7 | 40.3 | 2.7 | 35.4 | 1.7 | 40.6 | 2.0 | 39.2 | 1.7 | 41.9 | 2.0 | 41.6 | 2.5 | 41.3 |
| | 1.5 | 39.4* | 0.8 | 49.9 | 1.3 | 42.5 | 1.0 | 49.9 | 1.1 | 48.0 | 1.1 | 51.2 | 1.3 | 53.9 | 1.7 | 52.5 |
| $NaCl + NaOH.4H_2O$ | 4.2 | 30.3 | | | | | | | | | | | | | | |
| NaOH | 0.0 | 29.6 | | | | | | | | | | | | | | |
| $NaCl + NaOH.H_2O$ | 0.0 | 51.2 | 0.0 | 51.2 | 0.0 | 52.2 | 0.0 | 53.3 | | | | | | | | |
| $NaOH.H_2O$ | | | | | | | | | 0.0 | 54.3 | 0.0 | 55.4 | 0.0 | 57.8 | 0.0 | 63.5 |

* Solution supersaturated.

**$Cl^-$ $Na^+$ $K^+$**

$H_2O + NaCl + KCl$ (35, 97, 269, 307); *v. also* p. 313

| Solid phases | Liquid phase | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 4.4°C | | $t$ = 5°C | | $t$ = 16.03°C | | $t$ = 25°C | | $t$ = 50°C | | $t$ = 55°C | | $t$ = 75°C | | $t$ = 83°C | | $t$ = 100°C | |
| | % KCl | % NaCl | % KCl | % NaCl | % KCl | % NaCl | % KCl | % NaCl | % KCl | % NaCl | % KCl | % NaCl | % KCl | % NaCl | % KCl | % NaCl | % KCl | % NaCl | % KCl | % NaCl |
| | 21.99 | | 23.22 | | 22.93 | | 25.35 | | 26.99 | | 30.04 | | | | 33.20 | | | | 35.94 | |
| | | | | | | | | | 19.29 | 8.65 | | | | | | | | | | |
| KCl | | | | | | | | | 17.65 | 10.74 | | | | | | | | | | |
| | | | | | | | | | 15.30 | 14.12 | | | | | | | | | | |
| KCl + NaCl | 7.42 | 22.19 | 7.92 | 21.18 | 7.33 | 22.19 | 9.83 | 20.40 | 11.20 | 20.36 | 14.59 | 19.26 | 16.58 | 18.93 | 18.51 | 17.76 | 20.36 | 16.62 | 21.63 | 16.85 |
| | | 26.22 | | 26.32 | | 26.33 | | 26.32 | 10.32 | 20.84 | | 26.80 | | | | 27.41 | | | | 28.31 |
| NaCl | | | | | | | | | 7.03 | 22.68 | | | | | | | | | | |
| | | | | | | | | | 3.59 | 24.53 | | | | | | | | | | |
| | | | | | | | | | | 26.49 | | | | | | | | | | |

Invariant points: KCl + Ice at −11.1°C. $NaCl.2H_2O$ + Ice at −21.85°C. $NaCl.2H_2O$ + KCl + Ice at −23.7°C. $NaCl.2H_2O$ + NaCl + KCl at −2.35° C

**$ClO_3^-$ $NO_3^-$ $K^+$**

$H_2O + KClO_3 + KNO_3$

$t$ = 25°C (383)

| % $KClO_3$ | % $KNO_3$ |
|---|---|
| $KClO_3$ | |
| 7.745 | 0 |
| Solid soln. A* | |
| 7.65 | 0.68 |
| 7.07 | 1.55 |
| 6.52 | 3.59 |
| 5.76 | 7.12 |
| 5.10 | 12.81 |
| 4.39 | 18.97 |
| Solid soln. A* (saturated) + $KNO_3$ | |
| 3.90 | 27.14 |
| $KNO_3$ | |
| 3.61 | 27.21 |
| 1.63 | 27.57 |
| 0 | 27.24 |

* Contains 0–14.37M % $KNO_3$.

**$ClO_3^-$ $CO_3^{--}$ $Na^+$** (214)

$H_2O + NaClO_3 + Na_2CO_3$

$t$ = 24.2°C

| % $Na_2CO_3$ | % $NaClO_3$ |
|---|---|
| $NaClO_3$ | |
| 0.0 | 49.65 |
| 3.86 | 46.06 |

**$ClO_3^-$ $CO_3^{--}$ $Na^+$**,—(*Cont'd*)

| % $Na_2CO_3$ | % $NaClO_3$ |
|---|---|
| $NaClO_3$ | |
| 5.98 | 42.91 |
| 10.75 | 37.30 |
| $NaClO_3 + Na_2CO_3.7H_2O$ | |
| 11.12 | 36.90 |
| $Na_2CO_3.7H_2O$ | |
| 11.59 | 36.21 |
| 11.90 | 35.20 |
| 13.40 | 30.08 |
| 14.41 | 27.50 |
| $Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$ | |
| 14.43 | 27.04 |
| $Na_2CO_3.10H_2O$ | |
| 16.55 | 15.38 |
| 17.74 | 11.58 |
| 17.85 | 18.96 |
| 20.30 | 3.94 |
| 22.18 | 0.0 |
| $t$ = 40°C | |
| $NaClO_3$ | |
| 0.0 | 53.79 |
| $NaClO_3 + Na_2CO_3.H_2O$ | |
| 7.46 | 46.45 |
| $Na_2CO_3.H_2O$ | |
| 32.89 | 0.0 |

**$ClO_3^-$ $CO_3^{--}$ $Na^+$ $K^+$**

$H_2O + NaClO_3 + K_2CO_3$; *v.* Fig. 71

$t$ = 24.2°C (214)

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | 0.5$Na_2CO_3$ | 0.5$K_2CO_3$ | $KClO_3$ | $NaClO_3$ |
| A | $Na_2CO_3.10H_2O$ | 97.20 | | | |
| B | $Na_2CO_3.10H_2O + NaKCO_3.6H_2O$ | 126.00 | 61.2 | | |
| C | $NaKCO_3.6H_2O + K_2CO_3.2H_2O$ | 39.6 | 280.8 | | |
| D | $K_2CO_3.2H_2O$ | | 291.6 | | |
| E | $K_2CO_3.2H_2O + KClO_3$ | | 288.0 | 0.54 | |
| F | $KClO_3$ | | | 11.70 | |
| G | $KClO_3 + NaClO_3$ | | | 4.50 | 169.20 |
| H | $NaClO_3$ | | | | 167.40 |
| I | $NaClO_3 + Na_2CO_3.7H_2O$ | 72.0 | | | 120.6 |
| J | $Na_2CO_3.7H_2O + Na_2CO_3.10H_2O$ | 83.16 | | | 81.0 |
| P | $KClO_3 + NaClO_3 + Na_2CO_3.7H_2O$ | 75.6 | | 3.78 | 113.04 |
| Q | $KClO_3 + Na_2CO_3.7H_2O + Na_2CO_3.10H_2O$ | 83.16 | | 3.60 | 75.96 |
| R | $Na_2CO_3.10H_2O + KClO_3 + NaKCO_3.6H_2O$ | 114.12 | 72.0 | 1.08 | |
| S | $NaKCO_3.6H_2O + KClO_3 + K_2CO_3.2H_2O$ | 25.92 | 234.0 | 0.9 | |

### $ClO_3^-$ $CO_3^{--}$ $K^+$ (214)
$H_2O + KClO_3 + K_2CO_3$

| Solid phases | Liquid phase, $t$ = 24.2°C | | $t$ = 40°C | |
|---|---|---|---|---|
| | % $K_2CO_3$ | % $KClO_3$ | % $K_2CO_3$ | % $KClO_3$ |
| $K_2CO_3.2H_2O$ | 52.95 | | 54.40 | |
| $K_2CO_3.2H_2O + KClO_3$ | 52.67 | 0.189 | 51.80 | 1.04 |
| | 49.24 | 0.252 | 29.24 | 1.46 |
| | 36.59 | 0.69 | 18.81 | 4.09 |
| | 30.55 | 1.09 | | 12.44 |
| $KClO_3$ | 23.42 | 1.65 | | |
| | 18.53 | 2.29 | | |
| | 17.80 | 2.40 | | |
| | 8.81 | 3.92 | | |
| | | 7.42 | | |

### $ClO_3^-$ $HC_4H_4O_6^-$ $K^+$
$H_2O + KClO_3 + KHC_4H_4O_6$
$t$ = 25°C (283)*

| $M_{KClO_3}$/l | $M_{KHC_4H_4O_6}$/l $KHC_4H_4O_6$ |
|---|---|
| 0 | 0.0347 |
| 0.025 | 0.02562 |
| 0.05 | 0.01974 |
| 0.10 | 0.01382 |
| 0.20 | 0.00918 |

* Determinations are mean of two results.

### $ClO_3^-$ $OsO_4$ $K^+$
$H_2O + OsO_4 + KClO_3$
$t$ = 14°C (208)
g per 100g $H_2O$

| $OsO_4$ | $KClO_3$ |
|---|---|
| 0 | 5.32 |
| 10 | 5.65 |

### $ClO_3^-$ $Tl^+$ $K^+$
$H_2O + TlClO_3 + KClO_3$
$t$ = 10°C (16)

| Solid phases | M % $KClO_3$ | Liquid phase, % $KClO_3$ | % $TlClO_3$ |
|---|---|---|---|
| $TlClO_3$ | 0 | 0 | 2.510 |
| Solid soln. I* | 2 | 0.673 | 1.922 |
| | 12.6 | 2.539 | 1.167 |
| | 25.01 | 3.875 | 0.874 |
| Solid soln. I + Solid soln. II† | | 4.490 | 0.766 |
| Solid soln. II† | 99.6 | 4.546 | 0.648 |
| | 99.62 | 4.573 | 0.469 |
| | 99.67 | 4.562 | 0.268 |
| $KClO_3$ | 100 | 4.833 | 0 |

* Solid soln. I contains from 0 to 36.3 molal % $KClO_3$.
† Solid soln. II contains from 98 to 100 molal % $KClO_3$.

### $ClO_3^-$ $Na^+$ $K^+$ (214)
$H_2O + NaClO_3 + KClO_3$

| Solid phases | Liquid phase, $t$ = 24.2°C | | $t$ = 40°C | |
|---|---|---|---|---|
| | % $KClO_3$ | % $NaClO_3$ | % $KClO_3$ | % $NaClO_3$ |
| | 7.50 | | 12.44 | |
| | 6.91 | 6.73 | 8.02 | 10.94 |
| | 5.20 | 20.44 | 4.51 | 31.13 |
| $KClO_3$ | 4.08 | 27.90 | 4.22 | 35.41 |
| | 3.28 | 31.10 | 3.40 | 48.03 |
| | 3.35 | 36.91 | | |
| | 2.82 | 43.99 | | |
| $KClO_3 + NaClO_3$ | 1.53 | 49.18 | 3.24 | 51.97 |
| $NaClO_3$ | | 49.65 | | 53.80 |

### $ClO_3^-$ $K^+$: $H_2O$ + KOH + $KClO_3$; $t$ = 20°C (49)

| $M_{KClO_3}$/l | $M_{KOH}$/l | $M_{KClO_3}$/l | $M_{KOH}$/l |
|---|---|---|---|
| $KClO_3$ | | | |
| 0.0924 | 4.71 | 0.0287 | 10.95 |
| 0.0882 | 5.06 | 0.0254 | 12.19 |
| 0.0609 | 6.35 | 0.0215 | 14.02 |
| 0.0445 | 7.95 | 0.0195 | 14.85 |
| 0.0410 | 8.60 | 0.0191 | 15.02 |
| 0.0351 | 9.41 | | |

### $ClO_4^-$ $SO_4^{--}$ $NH_4^+$ (142)
$H_2O + NH_4ClO_4 + (NH_4)_2SO_4$

| Solid phases | Liquid phase, $t$ = 25°C % $NH_4ClO_4$ | % $(NH_4)_2SO_4$ | $t$ = 60°C % $NH_4ClO_4$ | % $(NH_4)_2SO_4$ |
|---|---|---|---|---|
| $NH_4ClO_4$ | 20.02 | 0.0 | 33.60 | 0.0 |
| | 13.11 | 11.06 | 28.56 | 7.04 |
| | 8.15 | 22.45 | 24.91 | 11.89 |
| | 4.24 | 33.75 | 21.66 | 16.69 |
| | | | 17.02 | 23.71 |
| | | | 12.60 | 30.80 |
| $NH_4ClO_4 + (NH_4)_2SO_4$ | 3.00 | 41.70 | 8.26 | 40.92 |
| $(NH_4)_2SO_4$ | 1.22 | 42.83 | 3.48 | 44.12 |
| | 0.0 | 43.50 | 0.0 | 46.80 |

### $ClO_4^-$ $SO_4^{--}$ $NH_4^+$ $Na^+$ (142)
$H_2O + NH_4ClO_4 + Na_2SO_4$

| | Solid phases | Liquid phase—M per 1000M $H_2O$ $NH_4ClO_4$ | $0.5(NH_4)_2SO_4$ | $NaClO_4$ | $0.5Na_2SO_4$ |
|---|---|---|---|---|---|
| | $t$ = 25°C; v. Fig. 72 | | | | |
| A | $Na_2SO_4.10H_2O$ | | | | 70.4 |
| B | $Na_2SO_4.10H_2O + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | | 63.77 | | 108.6 |
| | $(NH_4)_2SO_4.Na_2SO_4.4H_2O$ | | 127.8 | | 61.3 |
| C | $(NH_4)_2SO_4.Na_2SO_4.4H_2O + (NH_4)_2SO_4$ | | 198.10 | | 38.01 |
| D | $(NH_4)_2SO_4$ | | 209.2 | | |
| E | $(NH_4)_2SO_4 + NH_4ClO_4$ | 8.41 | 205.7 | | |
| | | 17.90 | 88.24 | | |
| F | $NH_4ClO_4$ | 38.3 | | | |
| | | 12.26 | | 178.1 | |
| G | $NH_4ClO_4 + NaClO_4.H_2O$ | 7.45 | | 318.92 | |
| H | $NaClO_4.H_2O$ | | | 310.0 | |
| I | $NaClO_4.H_2O + Na_2SO_4$ | | | 310.6 | 2.06 |
| | $Na_2SO_4$ | | | 174.8 | 6.98 |
| J | $Na_2SO_4 + Na_2SO_4.10H_2O$ | | | 76.76 | 38.54 |
| P | $NH_4ClO_4 + NaClO_4.H_2O + Na_2SO_4$ | 7.19 | | 311.44 | 1.62 |
| | $NH_4ClO_4 + Na_2SO_4$ | 15.77 | | 83.34 | 31.51 |
| Q* | $NH_4ClO_4 + Na_2SO_4 + Na_2SO_4.10H_2O$ | | | | |
| R | $NH_4ClO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O +$ $Na_2SO_4.10H_2O$ | 11.28 | 53.1 | | 103.7 |
| | $NH_4ClO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | 8.92 | 102.9 | | 62.6 |
| S | $(NH_4)_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O +$ $NH_4ClO_4$ | 7.59 | 191.98 | | 32.8 |
| | $t$ = 60°C | | | | |
| | $Na_2SO_4$ | | | | 115.10 |
| | $Na_2SO_4 + (NH_4)_2SO_4$ | | 215.2 | | 88.46 |
| | $(NH_4)_2SO_4$ | | 239.8 | | |
| | $(NH_4)_2SO_4 + NH_4ClO_4$ | 24.68 | 219.2 | | |
| | | 43.88 | 109.04 | | |
| | | 77.50 | | | |
| | $NH_4ClO_4$ | 47.72 | | 64.42 | |
| | | 26.12 | | 226.4 | |
| | $NH_4ClO_4 + NaClO_4$ | 11.45 | | 423.8 | |
| | $NaClO_4$ | | | 425.4 | |
| | $NaClO_4 + Na_2SO_4$ | | | 431.9 | 2.92 |

**$ClO_4^-$ $SO_4^{--}$ $NH_4^+$ $Na^+$.—(*Continued*)**

| Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|
| | $NH_4ClO_4$ | $0.5(NH_4)_2SO_4$ | $NaClO_4$ | $0.5Na_2SO_4$ |
| *t* = 60°C.—(*Continued*) | | | | |
| $Na_2SO_4$ | | | 165.98 | 6.52 |
| | | | 73.62 | 28.61 |
| | | | 38.54 | 55.70 |
| $NH_4ClO_4 + NaClO_4 + Na_2SO_4$ | 11.48 | | 431.6 | 2.44 |
| $NH_4ClO_4 + Na_2SO_4$ | 44.30 | | 74.06 | 22.04 |
| | 69.11 | | | 83.96 |
| | 29.40 | 112.92 | | 84.86 |
| $NH_4ClO_4 + Na_2SO_4 + (NH_4)_2SO_4$ | 16.82 | 206.8 | | 80.88 |

* Position of point on diagram estimated.

**$ClO_4^-$ $SO_4^{--}$ $Ca^{++}$ $K^+$: $H_2O + KClO_4 + CaSO_4$; *t* = 25°C (94)**

M per 1000M $H_2O$

| $K_2SO_4$ | $CaSO_4$ | $KClO_4$ |
|---|---|---|
| $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O + KClO_4$ | | |
| 2.944 | 0.256 | 1.635 |

**$ClO_4^-$ $SO_4^{--}$ $Na^+$ (142): $H_2O + NaClO_4 + Na_2SO_4$**

| Solid phases | Liquid phase | | | |
|---|---|---|---|---|
| | *t* = 25°C | | *t* = 60°C | |
| | % $NaClO_4$ | % $Na_2SO_4$ | % $NaClO_4$ | % $Na_2SO_4$ |
| $Na_2SO_4.10H_2O$ | 0.0 | 21.71 | | |
| | 5.79 | 18.15 | | |
| | 18.72 | 12.56 | | |
| $Na_2SO_4.10H_2O + Na_2SO_4$ | 31.21 | 9.07 | | |
| $Na_2SO_4$ | 41.68 | 4.28 | 0.0 | 31.20 |
| | 53.58 | 1.24 | 17.70 | 14.90 |
| | | | 31.55 | 6.95 |
| | | | 52.47 | 1.11 |
| | | | 64.65 | 0.37 |
| $Na_2SO_4 + NaClO_4.H_2O$ | 67.67 | 0.26 | | |
| $NaClO_4.H_2O$ | 67.60 | 0 | | |
| $Na_2SO_4 + NaClO_4$ | | | 74.40 | 0.29 |
| $NaClO_4$ | | | 74.30 | 0.0 |

Transition points

$NaClO_4.H_2O + NaClO_4$ at 50.8°C; 73.30% $NaClO_4$.
$NaClO_4.H_2O$ + Ice at −32°C; 56.00% $NaClO_4$.
$Na_2SO_4.10H_2O + Na_2SO_4$ at 32.38°C.

**$ClO_4^-$ $NH_4^+$ $Na^+$ (142): $H_2O + NH_4ClO_4 + NaClO_4$**

| Solid phases | Liquid phase | | | |
|---|---|---|---|---|
| | *t* = 25°C | | *t* = 60°C | |
| | % $NH_4ClO_4$ | % $NaClO_4$ | % $NH_4ClO_4$ | % $NaClO_4$ |
| $NH_4ClO_4$ | 20.00 | 0.0 | 33.60 | 0.0 |
| | 15.07 | 9.29 | 25.78 | 12.35 |
| | 9.54 | 25.85 | 18.00 | 25.00 |
| | 4.87 | 43.64 | 12.54 | 37.34 |
| | 3.50 | 52.86 | 6.30 | 56.95 |
| $NH_4ClO_4 + NaClO_4.H_2O$ | 1.51 | 67.42 | | |
| $NH_4ClO_4 + NaClO_4$ | | | 1.87 | 72.86 |
| $NaClO_4.H_2O$ | 0.0 | 67.60 | | |
| $NaClO_4$ | | | 0.0 | 74.30 |

Transition points

$NaClO_4.H_2O + NaClO_4$ at 50.8°C; 73.30% $NaClO_4$.
$NaClO_4.H_2O$ + Ice at −32°C; 56.00% $NaClO_4$.
$NH_4ClO_4$ + Ice at −2.7°C; 9.8% $NH_4ClO_4$.

**$ClO_4^-$ $SO_4^{--}$ $K^+$**

$H_2O + KClO_4 + K_2SO_4$

*t* = 25°C (280)

| % $K_2SO_4$ | % $KClO_4$ |
|---|---|
| $KClO_4$ | |
| 0 | 2.052 |
| 0.4276 | 1.800 |
| 0.8532 | 1.615 |

**$ClO_4^-$ $AsO^+$**

$H_2O + HClO_4 + As_2O_3$

*t* = 25°C (360)

M per 1000g $H_2O$

| $HClO_4$ | $HAsO_2$ |
|---|---|
| $As_2O_3$ | |
| 0.0 | 0.2067 |
| 0.2162 | 0.1963 |
| 0.5588 | 0.1900 |
| 0.9450 | 0.1770 |

**$ClO_4^-$ $MnO_4^-$ $K^+$**

$H_2O + KClO_4 + KMnO_4$

*t* = 6.8–7.2°C (277)

| Solid phases, % $KMnO_4$ | Liquid phase | |
|---|---|---|
| | % $KMnO_4$ | % $KClO_4$ |
| 0 | 0.0 | 0.88 |
| 3.227 | 0.46 | 0.75 |
| 6.644 | 0.880 | 0.634 |
| 11.011 | 1.060 | 0.586 |
| 17.822 | 1.557 | 0.528 |
| 18.453 | 1.686 | 0.518 |
| 26.030 | 1.903 | 0.469 |
| 29.05 | 1.993 | 0.461 |
| 33.844 | 2.104 | 0.477 |
| 37.361 | 2.244 | 0.411 |
| 43.342 | 2.469 | 0.423 |
| 47.713 | 2.601 | 0.401 |
| 70.177 | 2.835 | 0.342 |
| 70.175 | 3.019 | 0.372 |
| 78.293 | 3.068 | 0.323 |
| 86.128 | 3.114 | 0.288 |
| 95.036 | 3.603 | 0.382 |
| 96.903 | 3.972 | 0.192 |
| 100.00 | 4.071 | 0.0 |

**$ClO_4^-$ $K^+$**

$H_2O + HClO_4 + KClO_4$

*t* = 25.2°C (380)

| $HClO_4$* | % $KClO_4$ |
|---|---|
| $KClO_4$ | |
| 0.0 | 2.085 |
| 0.01 | 1.999 |
| 0.1 | 1.485 |
| 1.0 | 0.527 |

* Moles per l of soln. used as solvent.

**$Br^-$ $I^-$ $K^+$**

$H_2O + KBr + KI$

*t* = 25°C (3); *v.* Fig. 73

| % KBr | % KI |
|---|---|
| KI | |
| 0.0 | 149.26 |
| Solid Soln. I* | |
| 18.54 | 130.61 |
| 22.15 | 127.10 |
| Solid soln. I* + solid soln. II† | |
| 29.92‡ | 119.49‡ |
| Solid soln. II† | |
| 34.14 | 95.36 |
| 42.32 | 66.63 |
| KBr | |
| 68.47 | 0.0 |

* Solid soln. I contains from 0 to 14 % KBr. † Solid soln. II, from 93.23 to 100 % KBr. ‡ Average of four results.

**$Br^-$ $SO_4^{--}$ $Ca^{++}$ $K^+$**

$H_2O + CaBr_2 + K_2SO_4$

*t* = 25°C (94)

M per 1000M $H_2O$

| A* | B† | C‡ | D§ |
|---|---|---|---|
| $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O$ | | | |
| 2.71 | 0.231 | 1.52 | |
| 1.300 | 0.365 | 7.745 | |
| | 0.726 | 22.05 | 0.33ε |
| | 0.334 | 53.41 | 4.23 |

*A = $K_2SO_4$. ‡C = KBr.
†B = $CaSO_4$. §D = $CaBr_2$.

**$Br^-$ $NO_3^-$ $Sr^{++}$**

$H_2O + SrBr_2 + Sr(NO_3)_2$

*t* = 25°C (164)

| % $SrBr_2$ | % $Sr(NO_3)_2$ |
|---|---|
| $SrBr_2.6H_2O$ | |
| 57.599 | 0.0 |
| 51.422 | 0.366 |
| 51.246 | 0.733 |
| 50.891 | 1.469 |
| 50.084 | 3.042 |
| 48.621 | 5.885 |
| 43.512 | 15.961 |

**$Br^- NH^+ AsO_2^-$**

$H_2O + NH_4Br + As_2O_3$

$t = 30°C$ (353)

| % $As_2O_3$ | % $NH_4Br$ |
|---|---|
| $As_2O_3$ | |
| 2.26 | 0.0 |
| $(As_2O_3)_2.NH_4Br + As_2O_3$ | |
| 2.25 | 0.339 |
| $(As_2O_3)_2.NH_4Br$ | |
| 0.679 | 4.37 |
| 0.518 | 7.18 |
| 0.386 | 13.31 |
| 0.303 | 20.14 |
| 0.237 | 31.69 |
| 0.154 | 41.34 |
| $(As_2O_3)_2.NH_4Br + NH_4Br$ | |
| 0.190 | 45.66 |

**$Br^- NH_4^+ AsO_2^-$.**—*(Cont'd)*

| % $As_2O_3$ | % $NH_4Br$ |
|---|---|
| $NH_4Br$ | |
| 0.0 | 44.80* |

* By interpolation from earlier work.

**$Br^- NH_4^+ PtBr_6^{--}$**

$H_2O + NH_4Br + (NH_4)_2PtBr_6$

$t = 20°C$ (13)

| $M_{NH_4Br}/l$ | $g(NH_4)_2PtBr_6/l$ |
|---|---|
| $(NH_4)_2PtBr_6$ | |
| 2.0 | 0.032 |
| 1.0 | 0.080 |
| 0.2 | 0.168 |
| 0.1 | 0.359 |

**$Br^- NH_4^+ K^+$: $H_2O + NH_4Br + KBr$; $t = 25°C$ (129)**

| Solid phases—M% | | Liquid phase—M/l | |
|---|---|---|---|
| $NH_4Br$ | KBr | $NH_4Br$ | KBr |
| Solid soln. I | | | |
| 0.00 | 100.00 | 0.00 | 4.6862 |
| 0.26 | 99.74 | 0.0653 | 4.6522 |
| 1.27 | 98.73 | 0.2515 | 4.5051 |
| 3.02 | 96.78 | 0.5237 | 4.3390 |
| 8.42 | 91.58 | 1.5596 | 3.7043 |
| 17.20 | 82.80 | 2.6750 | 2.9167 |
| 27.98 | 72.02 | 3.5463 | 2.2021 |
| 32.58 | 67.47 | 3.8911 | 2.1856 |
| 39.45 | 60.55 | 4.2631 | 1.9501 |
| variable | variable | 4.4130 | 1.8674 |
| Solid soln. II | | | |
| 98.53 | 1.47 | 4.9061 | 1.5096 |
| 100.00 | 0.00 | 5.8914 | 0.00 |

**$Br^- AsO_2^- Ca^{++}$**

$H_2O + As_2O_3 + CaBr_2$

$t = 30°C$ (354)

| % $As_2O_3$ | % $CaBr_2$ |
|---|---|
| $As_2O_3$ | |
| 1.78 | 0.0 |
| 1.58 | 9.65 |
| 1.28 | 20.13 |
| 0.912 | 34.90 |
| 0.698 | 47.67 |
| 0.513 | 52.06 |
| 0.562 | 55.95 |
| $As_2O_3 + CaBr_2.6H_2O$ | |
| 0.687 | 58.22 |
| $CaBr_2.6H_2O$ | |
| 0 | 58.20* |

* By interpolation from earlier work.

**$Br^- AsO_2^- Sr^{++}$**

$H_2O + As_2O_3 + SrBr_2$

$t = 30°C$ (354)

| % $As_2O_3$ | % $SrBr_2$ |
|---|---|
| $As_2O_3$ | |
| 2.26 | 0 |
| 1.69 | 11.69 |
| 1.74 | 22.09 |
| 1.48 | 31.98 |
| 1.25 | 41.91 |
| 1.07 | 46.87 |

**$Br^- AsO_2^- Sr^{++}$.**—*(Cont'd)*

| % $As_2O_3$ | % $SrBr_2$ |
|---|---|
| $As_2O_3 + SrBr_2.6H_2O$ | |
| 0.991 | 48.91 |
| $SrBr_2.6H_2O$ | |
| 0 | 49.11 |

**$Br^- AsO_2^- Ba^{++}$**

$H_2O + As_2O_3 + BaBr_2$

$t = 30°C$ (354)

| % $As_2O_3$ | % $BaBr_2$ |
|---|---|
| $As_2O_3$ | |
| 2.26 | 0 |
| 2.09 | 9.41 |
| 2.03 | 16.88 |
| 1.97 | 24.03 |
| $(As_2O_3)_2.BaBr_2$ | |
| 1.58 | 23.49 |
| 0.757 | 29.09 |
| 0.678 | 33.08 |
| 0.464 | 38.19 |
| 0.322 | 43.02 |
| $(As_2O_3)_2.BaBr_2 + BaBr_2.2H_2O$ | |
| 0.277 | 50.03 |
| $BaBr_2.2H_2O$ | |
| 0 | 50.62 |

**$Br^- AsO_2^- Li^+$**

$H_2O + As_2O_3 + LiBr$

$t = 30°C$ (353)

| % $As_2O_3$ | % LiBr |
|---|---|
| $As_2O_3$ | |
| 2.26 | 0.0 |
| 1.69 | 11.68 |
| 1.20 | 23.23 |
| 0.734 | 35.54 |
| $(As_2O_3)_2.LiBr + As_2O_3$ | |
| 0.534 | 37.00 |
| $(As_2O_3)_2.LiBr$ | |
| 0.332 | 42.62 |
| 0.290 | 43.86 |
| 0.281 | 43.87 |
| 0.198 | 46.75 |

**$Br^- AsO_2^- Na^+$**

$H_2O + As_2O_3 + NaBr$

$t = 30°C$ (353)

| % $As_2O_3$ | % NaBr |
|---|---|
| $As_2O_3$ | |
| 2.26 | 0.0 |
| 2.19 | 5.57 |
| 2.09 | 10.89 |
| 1.99 | 15.85 |
| 1.88 | 20.79 |
| 1.63 | 30.39 |
| 1.59 | 33.17 |
| 1.50 | 35.75 |
| 1.48 | 37.76 |
| $(As_2O_3)_3.NaBr$ | |
| 1.20 | 39.24 |
| 1.09 | 40.52 |
| 0.953 | 43.64 |
| 0.903 | 44.65 |
| 0.852 | 45.99 |
| 0.808 | 46.93 |
| $(As_2O_3)_3.NaBr + NaBr.2H_2O$ | |
| 0.719 | 50.25 |
| $NaBr.2H_2O$ | |
| 0.0 | 49.50*ca.** |

**$Br^- AsO_2^- K^+$**

$H_2O + As_2O_3 + KBr$

$t = 30°C$ (353)

| % $As_2O_3$ | % KBr |
|---|---|
| $As_2O_3$ | |
| 2.26 | 0.0 |
| $(As_2O_3)_2.KBr + As_2O_3$ | |
| 2.25 | 0.336 |
| $(As_2O_3)_2.KBr$ | |
| 0.818 | 2.51 |
| 0.563 | 6.58 |
| 0.460 | 12.78 |
| 0.350 | 19.10 |
| 0.327 | 22.59 |
| 0.293 | 25.09 |
| 0.242 | 31.06 |
| 0.275 | 36.98 |
| 0.174 | 41.70 |
| $(As_2O_3)_2.KBr + KBr$ | |
| 0.166 | 42.07 |
| KBr | |
| 0.0 | 41.3*ca.** |

* By interpolation from earlier work.

**$Br^- CO_3^{--} Na^+$**

$H_2O + NaBr + Na_2CO_3$

$t = 30°C$ (79)

| % NaBr | % $Na_2CO_3$ |
|---|---|
| $Na_2CO_3.10H_2O$ | |
| 0 | 27.98 |
| 2.41 | 27.54 |
| 4.06 | 26.72 |
| $Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$ | |
| 6.26 | 26.23 |
| $Na_2CO_3.7H_2O$ | |
| 11.00 | 23.40 |
| 12.22 | 22.68 |
| 16.88 | 19.86 |
| $Na_2CO_3.7H_2O + Na_2CO_3.H_2O$ | |
| 16.95 | 19.57 |
| $Na_2CO_3.H_2O$ | |
| 19.32 | 18.11 |
| 33.39 | 8.45 |
| 36.13 | 6.90 |
| 44.75 | 3.04 |
| $Na_2CO_3.7H_2O + NaBr.2H_2O$ | |
| 45.31 | 2.99 |
| $NaBr.2H_2O$ | |
| 45.68 | 2.60 |
| 49.40 | 0 |

**$Br^- HC_4H_4O_6^- K^+$**

$H_2O + KBr + KHC_4H_4O_6$

$t = 25°C$ (283)

| $M_{KBr}/l$* | $M_{KHC_4H_4O_6}/l$* |
|---|---|
| $KHC_4H_4O_6$ | |
| 0 | 0.0347 |
| 0.05 | 0.01965 |
| 0.10 | 0.01337 |
| 0.20 | 0.00865 |

* Mean of two results.

**$Br^- Pb^{++} Ca^{++}$**

$H_2O + PbBr_2 + CaBr_2$

$t = 25°C$ (181)

M per liter

| ½$CaBr_2$ | ½$PbBr_2$ |
|---|---|
| $PbBr_2$ | |
| 0.00 | 0.05250 |
| 0.52 | 0.01334 |
| 1.04 | 0.02410 |
| 2.08 | 0.08760 |
| 3.13 | 0.23500 |
| 4.17 | 1.03474 |

**$Br^- Pb^{++} Sr^{++}$**

$H_2O + PbBr_2 + SrBr_2$

$t = 25°C$ (181)

M per liter

| ½$SrBr_2$ | ½$PbBr_2$ |
|---|---|
| $PbBr_2$ | |
| 0.00 | 0.05250 |
| 0.52 | 0.01346 |
| 1.04 | 0.02546 |
| 2.08 | 0.08734 |
| 3.12 | 0.31180 |
| 4.16 | 1.13740 |

**$Br^- Pb^{++} Ba^+$**

$H_2O + PbBr_2 + BaBr_2$

$t = 25°C$ (181)

| M ½$BaBr_2$/l | M ½$PbBr_2$/l |
|---|---|
| | $PbBr_2$ |
| 0.00 | 0.05250 |
| 0.45 | 0.01214 |
| 0.91 | 0.02182 |
| 1.82 | 0.08886 |
| 2.76 | 0.32080 |
| 3.67 | 0.82800 |

**$Br^- Pb^{++} Na^+$**

$H_2O + PbBr_2 + NaBr$

$t = 25°C$ (181)

| M ½$PbBr_2$/l | $M_{NaBr}$/l |
|---|---|
| | $PbBr_2$ |
| 0.05250 | 0.00 |
| 0.01720 | 0.73 |
| 0.04494 | 1.47 |
| 0.14086 | 2.20 |
| 0.39160 | 2.93 |
| 0.78720 | 3.67 |
| 1.46740 | 4.40 |

**$Br^- Pb^{++} K^+$**

$H_2O + PbBr_2 + KBr$

$t = 25°C$ (51.1)

| % $PbBr_2$ | % KBr |
|---|---|
| | $PbBr_2$ |
| 0.969 | 0.0 |
| 0.946 | 0.056 |
| 0.875 | 0.131 |
| 0.782 | 0.423 |
| 0.347 | 1.325 |
| 0.256 | 2.292 |
| $PbBr_2 + 2PbBr_2.KBr$ | |
| 0.310 | 4.967 |
| $2PbBr_2.KBr$ | |
| 0.295 | 5.609 |
| 0.330 | 12.940 |
| 0.345 | 13.18 |
| 0.427 | 14.54 |
| 0.560 | 18.27 |
| 0.666 | 19.05 |
| 0.753 | 20.64 |
| 0.868 | 21.61 |
| 1.494 | 25.69 |
| $2PbBr_2.KBr + PbBr_2.KBr.-\frac{1}{3}H_2O$ | |
| 3.160 | 30.11 |
| $PbBr_2.KBr.\frac{1}{3}H_2O$ | |
| 3.622 | 31.97 |
| 4.248 | 33.80 |
| 5.038 | 35.68 |
| $PbBr_2.KBr.\frac{1}{3}H_2O + KBr$ | |
| 7.205 | 38.87 |
| KBr | |
| 4.929 | 39.32 |
| 1.835 | 40.28 |
| 0.0 | 40.52 |

**$Br^- Hg^{++} Ca^{++}$**

$H_2O + HgBr_2 + CaBr_2$

$t = 25°C$ (182)

| $M_{HgBr_2}$/l | $M_{CaBr_2}$/l |
|---|---|
| | $HgBr_2$(?) |
| 0.017 | 0 |
| 0.117 | 0.072 |
| 0.676 | 0.645 |
| 1.358 | 1.892 |
| 2.766 | 2.479 |
| 3.666 | 3.754 |

**$Br^- Hg^{++} Sr^{++}$**

$H_2O + HgBr_2 + SrBr_2$

$t = 25°C$ (182)

| $M_{HgBr_2}$/l | $M_{SrBr_2}$/l |
|---|---|
| | $HgBr_2$(?) |
| 0.017 | 0 |
| 0.104 | 0.062 |
| 0.471 | 0.328 |
| 0.902 | 0.668 |
| 1.770 | 1.401 |
| 2.238 | 1.872 |

**$Br^- Hg^{++} Ba^{++}$**

$H_2O + HgBr_2 + BaBr_2$

$t = 25°C$ (182)

| $M_{BaBr_2}$/l | $M_{HgBr_2}$/l |
|---|---|
| | $HgBr_2$(?) |
| 0 | 0.017 |
| 0.274 | 0.370 |
| 0.396 | 0.540 |
| 0.579 | 0.759 |
| 1.096 | 1.478 |

**$Br^- Hg^{++} Na^+$**

$H_2O + HgBr_2 + NaBr$

$t = 25°C$ (182)

| $M_{HgBr_2}$/l | $M_{NaBr}$/l |
|---|---|
| | $HgBr_2$(?) |
| 0.017 | 0 |
| 0.078 | 0.118 |
| 0.285 | 0.596 |
| 0.540 | 1.142 |
| 1.276 | 2.448 |
| 1.550 | 2.997 |
| 2.306 | 5.246 |

**$Br^- Hg^{++} K^+$**

$H_2O + HgBr_2 + KOH$

$t = ?$ (178)

| $M_{KOH}$/l | $M_{KBr}$/l | M ½ $HgBr_2$/l |
|---|---|---|
| | | HgO* |
| 0.0011 | 0.00685 | 0.0075 |
| 0.00208 | 0.00890 | 0.0043 |
| 0.00318 | 0.0104 | 0.0018 |
| 0.0636† | 0.9364† | 0.0636† |

* Solid phase not actually determined. Temperature used not given.
† Data from Bugarszky (51).

**$Br^- Hg^{++} K^+$**

$H_2O + HgBr_2 + KBr$

$t = 25°C$ (182)

| $M_{HgBr_2}$/l | $M_{KBr}$/l |
|---|---|
| | $HgBr_2$(?) |
| 0.017 | 0 |
| 0.098 | 0.209 |
| 0.472 | 0.770 |
| 1.360 | 2.380 |
| 1.930 | 3.470 |

**$Br^- Ca^{++}$**

$H_2O + Ca(OH)_2 + CaBr_2$; *v.* Fig. 74

$t = 25°C$ (270)

| | Solid phases | Liquid phase: % CaO | Liquid phase: % $CaBr_2$ |
|---|---|---|---|
| A | $CaO.H_2O$ | 0.118 | 0 |
| | $CaO.H_2O$ | 0.115 | 19.18 |
| B | $CaO.H_2O + 3CaO.CaBr_2.16H_2O$ | 0.097 | 20.75 |
| | $3CaO.CaBr_2.16H_2O$ | 0.080 | 32.92 |
| C | $3CaO.CaBr_2.16H_2O + 4CaO.3CaBr_2.16H_2O$ | 0.359 | 54.22 |
| | $4CaO.3CaBr_2.16H_2O$ | 0.199 | 58.90 |
| D | $4CaO.3CaBr_2.16H_2O + CaBr_2.6H_2O$ | 0.209 | 60.09 |
| | $CaBr_2.6H_2O$ | 0 | 60.07 |

**$Br^- Sr^{++}$**

$H_2O + Sr(OH)_2 + SrBr_2$; *v.* Fig. 75

$t = 25°C$ (270)

| | Solid phases | Liquid phase: % SrO | Liquid phase: % $SrBr_2$ |
|---|---|---|---|
| A | $SrO.9H_2O$ | 0.85 | 0 |
| B | $SrO.9H_2O + SrO.SrBr_2.9H_2O$ | 0.84 | 40.66 |
| | $SrO.SrBr_2.9H_2O$ | 0.28 | 47.65 |
| C | $SrO.SrBr_2.9H_2O + SrBr_2.6H_2O$ | 0.21 | 49.78 |
| D | $SrBr_2.6H_2O$ | 0 | 49.79 |

Invariant Point: at *ca.* −28°C.
$SrBr_2.6H_2O$ + Ice + Solution = 41.7% $SrBr_2$.

**$Br^- Ba^{++}$**

$H_2O + Ba(OH)_2 + BaBr_2$; *v.* Fig. 76

$t = 25°C$ (270)

| | Solid phases | Liquid phase: % BaO | Liquid phase: % $BaBr_2$ |
|---|---|---|---|
| A | $BaO.9H_2O$ | 4.05 | |
| B | $BaO.9H_2O + BaO.BaBr_2.5H_2O$ | 3.71 | 36.41 |
| C | $BaO.BaBr_2.5H_2O + BaBr_2.2H_2O$ | 0.79 | 50.65 |
| D | $BaBr_2.2H_2O$ | | 51.10 |

Invariant Point: at −22.6°C.
$BaBr_2.2H_2O$ + Ice + Solution = 46.6% $BaBr_2$.

**$Br^- K^+$**

$H_2O + KOH + KBr$

$t = 20°C$ (49)

| $M_{KOH}$/l | $M_{KBr}$/l |
|---|---|
| | KBr |
| 7.90 | 1.012 |
| 9.41 | 0.693 |
| 10.95 | 0.515 |
| 11.10 | 0.451 |
| 12.19 | 0.348 |
| 12.92 | 0.306 |
| 13.84 | 0.247 |
| 14.02 | 0.246 |
| 14.85 | 0.214 |
| 15.02 | 0.210 |

**$BrO_3^- C_2H_3O_2^- Ag^+$**

$H_2O + HC_2H_3O_2 + AgBrO_3$

$t = 25°C$ (184)

| g $HC_2H_3O_2$/l | g $AgBrO_3$/l |
|---|---|
| | $AgBrO_3$ |
| 0.0 | 1.9493 |
| 2.988 | 1.9429 |
| 5.985 | 1.9379 |
| 11.975 | 1.9206 |

**$BrO_3^- C_2H_3O_2^- Ag^+$**.—(*Cont'd*)

| g $HC_2H_3O_2$/l | g $AgBrO_3$/l |
|---|---|
| | $AgBrO_3$ |
| 29.943 | 1.863 |
| 59.880 | 1.8013 |
| 112.382 | 1.6178 |

**$I^- SO_4^{--} Ca^{++} Na^+ K^+$**

$H_2O + CaI_2 + Na_2SO_4 + K_2SO_4$

$t = 25°C$ (94)

M per 1000M $H_2O$

| NaI | $K_2SO_4$ | $CaSO_4$ | $CaSO_4.2H_2O + CaSO_4.-K_2SO_4.H_2O$ |
|---|---|---|---|
| 11.53 | 4.03 | 0.266 | |

**$I^- SO_4^{--} Ca^{++} K^+$**

$H_2O + CaI_2 + K_2SO_4$

$t = 25°C$ (94)

M per 1000M $H_2O$

| $K_2SO_4$ | $CaSO_4$ | KI | $CaI_2$ | $CaSO_4.2H_2O + CaSO_4.-K_2SO_4.H_2O$ |
|---|---|---|---|---|
| 0.731 | 0.443 | 11.25 | 0.0 | |
| 0.0 | 0.565 | 26.63 | 0.835 | |

**$I^-$ $NO_3^-$ $Pb^{++}$ $Cu^{++}$** (123)

$H_2O + PbI_2 + Cu(NO_3)_2$*

g per 1000g $H_2O$; $t$ = 20°C

| $Cu(NO_3)_2$ | $Pb(NO_3)_2$ |
|---|---|
| $PbI_2 + CuI + I_2$ | |
| 95.5 | 2.24 |
| 148.4 | 6.50 |
| 190.0 | 13.10 |
| 227.0 | 23.9 |
| 274.6 | 48.9 |
| 290.8 | 61.6 |
| 320.3 | 97.4 |
| $Pb(NO_3)_2 + PbI_2 + CuI + I_2$ | |
| 345.6 | 143.0 |

* $Cu(NO_3)_2 + PbI_2 \rightleftarrows Pb(NO_3)_2 + CuI + I_2$.

**$I^-$ $NH_4^+$ $(CH_3)_4N^+$**

$H_2O + NH_4OH + (CH_3)_4NI$

$t$ = 25°C (184)

| g $NH_4OH$/l | g $(CH_3)_4NI$/l |
|---|---|
| $(CH_3)_4NI$ | |
| 0.000 | 52.758 |
| 1.731 | 52.708 |
| 3.508 | 52.863 |
| 7.367 | 52.623 |
| 18.300 | 52.579 |
| 35.570 | 52.384 |
| 73.92 | 52.025 |

**$I^-$ $NH_4^+$ $Pb^{++}$** (103)

$H_2O + NH_4I + PbI_2$

| $t$ = 20°C | | $t$ = 50°C | |
|---|---|---|---|
| %$PbI_2$ | %$NH_4I$ | % $PbI_2$ | %$NH_4I$ |
| $PbI_2$ | | | |
| 0.06 | 0.0 | 0.17 | 0.0 |
| 0.02 | 3.54 | 0.14 | 6.13 |
| 0.03 | 6.06 | 0.15 | 9.91 |
| $PbI_2 + PbI_2.NH_4I.2H_2O$ | | | |
| 0.10 | 7.02 | 0.29 | 13.47 |
| $PbI_2.NH_4I.2H_2O$ | | | |
| 0.20 | 14.50 | 0.34 | 18.07 |
| 0.92 | 45.80 | 8.51 | 54.79 |
| 2.96 | 56.71 | 13.18 | 58.21 |
| $PbI_2.NH_4I.2H_2O + NH_4I$ | | | |
| 4.90 | 61.10 | 16.06 | 61.35 |
| $NH_4I$ | | | |
| 2.10 | 61.50 | 9.88 | 61.95 |
| 0.0 | 61.62 | 6.24 | 63.98 |
| | | 0.0 | 66.47 |

**$I^-$ $AsO_2^-$ $K^+$** (354)

$H_2O + As_2O_3 + KI$; $t$ = 30°C

| % $As_2O_3$ | % KI |
|---|---|
| $As_2O_3$ | |
| 2.26 | 0 |
| $(As_2O_3)_2.KI$ | |
| 0.772 | 1.19 |
| 0.296 | 9.56 |
| 0.183 | 22.89 |
| 0.150 | 34.31 |
| 0.119 | 40.79 |
| 0.081 | 47.07 |
| 0.115 | 53.51 |
| $(As_2O_3)_2.KI + KI$ | |
| 0.134 | 60.54 |
| KI | |
| 0 | 61.50* |

* By interpolation from earlier work.

**$I^-$ $CO_3^{--}$ $Na^+$**

$H_2O + NaI + Na_2CO_3$

$t$ = 30°C (79)

| % $Na_2CO_3$ | % NaI |
|---|---|
| $Na_2CO_3.10H_2O$ | |
| 27.4 | 0 |
| 26.5 | 2.4 |
| 25.5 | 4.7 |
| 25.2 | 5.2 |
| 24.4 | 8.6 |
| $Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$ | |
| 24.3* | 9.45* |
| 23.0 | 11.2 |
| 20.8 | 14.0 |
| 20.0 | 15.7 |
| 18.7 | 18.4 |
| $Na_2CO_3.7H_2O + Na_2CO_3.H_2O$ | |
| 15.25* | 25.4* |
| $Na_2CO_3.H_2O$ | |
| 13.1 | 29.1 |
| 10.4 | 33.3 |
| 6.4 | 40.4 |
| 4.2 | 46.0 |
| 3.1 | 49.5 |
| 2.7 | 51.0 |
| 1.5 | 54.6 |
| 0.9 | 57.6 |
| 0.6 | 61.2 |
| $Na_2CO_3.H_2O + NaI.2H_2O$ | |
| 0.33* | 65.5 |
| $NaI.2H_2O$ | |
| 0 | 65.5 |

* Mean of two determinations.

**$I^-$ $HC_4H_4O_6^-$ $K^+$**

$H_2O + KI + KHC_4H_4O_6$

$t$ = 25°C (283)

| $M_{KI}$/l* | $M_{KHC_4H_4O_6}$/l* |
|---|---|
| $KHC_4H_4O_6$ | |
| 0 | 0.0347 |
| 0.05 | 0.01959 |
| 0.10 | 0.01324 |
| 0.20 | 0.00860 |

* Mean of two results.

**$I^-$ $(CH_3)_4N^+$ $K^+$**

$H_2O + (CH_3)_4NI + KOH$

$t$ = 25°C (184)

| g KOH/l | g $(CH_3)_4NI$/l |
|---|---|
| $(CH_3)_4NI$ | |
| 0 | 52.72 |
| 3.198 | 52.30 |
| 6.28 | 51.88 |
| 14.07 | 50.40 |

**$I^-$ $Pb^{++}$ $K^+$** (103)

$H_2O + PbI_2 + KI$

| $t$ = 13°C | | $t$ = 50°C | |
|---|---|---|---|
| % $PbI_2$ | % KI | % $PbI_2$ | % KI |
| $PbI_2$ | | | |
| 0.05 | 0.0 | 0.17 | 0.0 |
| 0.001 | 2.21 | 0.02 | 9.33 |
| 0.001 | 4.18 | 0.27 | 21.0 |
| 0.002 | 9.09 | 1.82 | 29.51 |
| 0.003 | 14.01 | 2.52 | 30.57 |

**$I^-$ $Pb^{++}$ $K^+$.**—(*Continued*)

| $t$ = 13°C | | $t$ = 50°C | |
|---|---|---|---|
| % $PbI_2$ | % KI | % $PbI_2$ | % KI |
| $PbI_2 + PbI_2.KI.2H_2O$ | | | |
| 0.05 | 16.02 | 3.11 | 31.77 |
| $PbI_2.KI.2H_2O$ | | | |
| 0.19 | 21.32 | 3.99 | 36.18 |
| 0.68 | 34.45 | 5.56 | 42.08 |
| 0.97 | 40.21 | 11.59 | 54.63 |
| 3.30 | 54.36 | 13.33 | 55.00 |
| $PbI_2.KI.2H_2O + KI$ | | | |
| 4.54 | 56.55 | 14.14 | 56.41 |
| KI | | | |
| 3.10 | 56.90 | 9.72 | 58.49 |
| 0.0 | 57.66 | 5.55 | 60.28 |
| | | 1.52 | 61.98 |
| | | 0.0 | 62.39 |

g per 1000g $H_2O$ (334)

| °C | $PbI_2$ | KI |
|---|---|---|
| $PbI_2 + PbI_2.KI.2H_2O$ | | |
| 5 | | 163 |
| 10 | | 191 |
| 15 | 2 | 217 |
| 20 | 9 | 260 |
| 23 | 10.4 | 275 |
| 28 | 25 | 325 |
| 31 | 29 | 359 |
| 39 | 45 | 449 |
| 59 | 188 | 645 |
| 67 | 255 | 751 |
| 80 | 731 | 1 186 |
| 80 | 569.9 | 976.4 |
| 104.5 | 1 411 | 1 521 |
| 120 | 2 151 | 1 812 |
| 137 | 2 874 | 2 097 |
| 175 | 5 603 | 2 949 |
| 189 | | 3 339 |
| $KI + PbI_2.KI.2H_2O$ | | |
| 9 | 96.6 | 1 352 |
| 13 | 114.3 | 1 384 |
| 23 | 186.3 | 1 510 |
| 50 | 526.7 | 1 906 |
| 64 | 789.3 | 2 161 |
| 83.5 | 1 108.6 | 2 134 |
| 92 | 1 273 | 2 566 |
| 137 | 2 382 | 3 278 |
| 165 | 4 187 | 4 227 |
| 218 | 10 303 | |
| 241 | 12 803 | 7 998 |
| 242 | 12 749 | |
| 250 | 15 264 | |
| $PbI_2 + PbI_2.KI.\frac{1}{2}H_2O$ | | |
| 194 | | 3 727 |
| 207 | | 4 750 |

**$I^-$ $Pb^{++}$ $K^+$**

$H_2O + PbI_2 + KI$

$t$ = 25°C (51.1)

| % $PbI_2$ | % KI |
|---|---|
| $PbI_2$ | |
| 0.0758 | 0.0 |
| 0.0234 | 0.083 |
| 0.0092 | 0.166 |
| 0.0042 | 0.332 |
| 0.002 | 0.664 |
| 0.0019 | 0.830 |

**$I^-$ $Pb^{++}$ $K^+$.**—(*Continued*)

| % $PbI_2$ | % KI |
|---|---|
| $PbI_2$ | |
| 0.0016 | 1.661 |
| 0.0020 | 3.320 |
| 0.0073 | 8.307 |
| 0.0316 | 13.610 |
| 0.0578 | 14.910 |
| 0.253 | 19.45 |
| $PbI_2 + PbI_2.KI.2H_2O$ | |
| 0.428 | 21.32 |
| $PbI_2.KI.2H_2O$ | |
| 0.553 | 26.82 |
| 1.221 | 36.73 |
| 2.249 | 43.8 |
| 3.712 | 49.43 |
| 4.654 | 51.61 |
| 5.876 | 54.6 |
| $PbI_2.KI.2H_2O + KI$ | |
| 7.421 | 56.59 |
| KI | |
| 5.235 | 57.82 |
| 0.549 | 59.13 |
| 0.0 | 59.72 |

**$I^-$ $Hg^{++}$ $Ca^{++}$**

$H_2O + HgI_2 + CaI_2$

$t$ = 25°C (182)

| $M_{CaI_2}$/l | $M_{HgI_2}$/l |
|---|---|
| $HgI_2$(?) | |
| 0.053 | 0.050 |
| 0.252 | 0.261 |
| 0.468 | 0.440 |
| 0.484 | 0.458 |
| 1.799 | 1.706 |

**$I^-$ $Hg^{++}$ $Sr^{++}$**

$H_2O + HgI_2 + SrI_2$

$t$ = 25°C (182)

| $M_{HgI_2}$/l | $M_{SrI_2}$/l |
|---|---|
| $HgI_2$(?) | |
| 0.212 | 0.254 |
| 0.320 | 0.355 |
| 0.582 | 0.539 |
| 0.694 | 0.608 |

**$I^-$ $Hg^{++}$ $Ba^{++}$**

$H_2O + HgI_2 + BaI_2$

$t$ = 25°C (182)

| $M_{BaI_2}$/l | $M_{HgI_2}$/l |
|---|---|
| $HgI_2$(?) | |
| 0.099 | 0.059 |
| 0.748 | 0.742 |
| 0.978 | 0.898 |
| 1.508 | 1.462 |

**$I^-$ $Hg^{++}$ $Na^+$**

$H_2O + HgI_2 + NaI$

$t$ = 25°C (182)

| $M_{HgI_2}$/l | $M_{NaI}$/l |
|---|---|
| $HgI_2$(?) | |
| 0.412 | 0.794 |
| 0.622 | 1.385 |
| 0.945 | 2.225 |

**$I^-$ $Hg^{++}$ $K^+$; *v.* p. 320**

### $I^- Ag^+ K^+$ (92)

$H_2O + AgI + KI$

| Solid phases | Liquid phase, $t$ = 0°C | | $t$ = 30°C | | $t$ = 50°C | |
|---|---|---|---|---|---|---|
| | % KI | % AgI | % KI | % AgI | % KI | % AgI |
| AgI | 9.8 | 0.2 | 10.2 | 0.10 | 24.8 | 2.5 |
| | 20.5 | 1.5 | 31.4 | 10.0 | 33.8 | 16.0 |
| | 26.1 | 6.5 | 37.6 | 29.4 | 36.7 | 28.0 |
| | 34.6 | 26.6 | 38.8 | 42.8 | 38.1 | 39.0 |
| | 36.4 | 28.1 | | | 36.2 | 51.8 |
| AgI + AgI.KI | 41.3 | 38.0 | | | 36.6 | 53.5 |
| AgI.KI | 42.0 | 37.9 | | | 37.1 | 53.5 |
| | 42.70 | 37.6 | | | | |
| AgI.KI + KI | 44.0 | 37.9 | | | 37.6 | 53.4 |
| KI | 46.6 | 31.3 | 43.9 | 42.8 | 40.2 | 50.4 |
| | 50.5 | 21.7 | 46.9 | 35.8 | 43.2 | 45.0 |
| | 51.2 | 18.0 | 55.5 | 16.0 | 47.10 | 38.0 |
| | 53.0 | 9.0 | 0 | 60.35 | 55.5 | 22.8 |
| | 56.10 | 0 | | | 59.1 | 10.7 |
| AgI.2KI + KI | 48.7 | 27.5 | 43.15 | 44.10 | | |
| AgI.2KI | 50.3 | 21.0 | 39.5 | 49.6 | | |
| AgI + AgI.2KI | | | 38.6 | 49.7 | | |
| AgI.2KI | | | 40.9 | 47.7 | | |
| | | | 41.4 | 46.3 | | |

### $I^- Ca^{++}$

$H_2O + Ca(OH)_2 + CaI_2$; *v.* Fig. 77

$t$ = 25° (270)

| | Solid phases | Liquid phase, % CaO | % $CaI_2$ |
|---|---|---|---|
| A | $CaO.H_2O$ | 0.118 | |
| B | $CaO.H_2O + 3CaO.CaI_2.16H_2O$ | 0.097 | 28.44 |
| C | $3CaO.CaI_2.16H_2O + CaI_2.6H_2O$ | 0.587 | 66.72 |
| D | $CaI_2.6H_2O$ | | 66.80 |

### $I^- Hg^{++} K^+$

$H_2O + HgI_2 + KI$

$t$ = 25°C (182)

| $M_{HgI_2}$/l | $M_{KI}$/l |
|---|---|
| $HgI_2$(?) | |
| 0.127 | 0.303 |
| 0.180 | 0.390 |
| 0.510 | 1.034 |
| 0.700 | 1.554 |
| 1.224 | 2.519 |

### $I^- Sr^{++}$

$H_2O + Sr(OH)_2 + SrI_2$

$t$ = 25°C (270)

| % SrO | % $SrI_2$ |
|---|---|
| $SrO.9H_2O$ | |
| 0.85 | 0.0 |
| 0.57 | 22.36 |
| 0.53 | 29.98 |
| 0.55 | 39.50 |
| $SrO.9H_2O + 2SrO.SrI_2.9H_2O$ | |
| 0.74 | 49.37 |
| $2SrO.SrI_2.9H_2O$ | |
| 0.72 | 53.04 |
| 0.60 | 54.16 |
| 0.51 | 55.09 |
| 0.46 | 55.58 |
| 0.19 | 60.31 |
| 0.18 | 60.77 |
| $2SrO.SrI_2.9H_2O + SrI_2.6H_2O$ | |
| 0.16 | 64.04 |

### $I^- Sr^{++}$.—(*Continued*)

| % SrO | % $SrI_2$ |
|---|---|
| $SrI_2.6H_2O$ | |
| 0.0 | 64.70 |

### $I^- Ba^{++}$

$H_2O + Ba(OH)_2 + BaI_2$

$t$ = 25°C (270)

g per 100g $H_2O$

| BaO | $BaI_2$ |
|---|---|
| $BaO.9H_2O$ | |
| 4.05 | 0.0 |
| 3.25 | 18.38 |
| 3.01 | 28.43 |
| 3.00 | 32.92 |
| 3.08 | 42.28 |
| $BaO.9H_2O + BaO.BaI_2.9H_2O$ | |
| 3.14 | 44.99 |
| $BaO.BaI_2.9H_2O$ | |
| 1.67 | 40.85 |
| 1.25 | 52.39 |
| 1.04 | 53.68 |
| 0.64 | 56.77 |
| 0.40 | 60.33 |
| 0.36 | 62.76 |
| $BaO.BaI_2.9H_2O + BaI_2.2H_2O$ | |
| 0.21 | 68.51 |
| $BaI_2.2H_2O$ | |
| 0.27 | 68.53 |
| 0.0 | 68.59 |

### $I^- K^+$

$H_2O + KOH + KI$

$t$ = 20°C (49)

| $M_{KOH}$/l | $M_{KI}$/l |
|---|---|
| KI | |
| 9.41 | 1.72 |
| 10.95 | 1.23 |
| 11.10 | 1.176 |
| 12.19 | 0.933 |
| 12.92 | 0.824 |
| 14.02 | 0.672 |
| 15.02 | 0.558 |

### $IO_3^- SO_4^{--}$

$H_2O + HIO_3 + H_2SO_4$

$t$ = 24.77°C (242)

*v.* Fig. 77*a*

| % $H_2SO_4$ | g $I_2O_5$/l |
|---|---|
| $HIO_3$(?) | |
| 50.0 | 54.79 |
| 60.0 | 34.68 |
| 75.0 | 19.48 |
| 78.0 | 18.66 |
| $I_2O_5$(?) | |
| 79.6 | 18.50 |
| 82.0 | 18.8 |
| 84.6 | 19.3 |
| 86.0 | 17.1 |
| 87.4 | 15.8 |
| 89.0 | 15.10 |
| 90.3 | 14.50 |
| 92.0 | 13.5 |
| 96.0 | 11.0 |
| 98.0 | 9.5 |
| 99.9 | 3.48 |
| 102 | 1.28 |
| 104 | 1.90 |
| 106 | 2.67 |

### $IO_3^- NO_3^- Pb^{++}$

$H_2O + Pb(IO_3)_2 + Pb(NO_3)_2$

$t$ = 25°C (163)

M per liter

| $\frac{1}{2}Pb(IO_3)_2$ | $\frac{1}{2}Pb(NO_3)_2$ |
|---|---|
| $Pb(IO_3)_2$ | |
| 0.0001102 | 0.0 |
| 0.0000870 | 0.0001 |
| 0.0000411 | 0.001 |
| 0.0000185 | 0.01 |
| 0.0000160 | 0.100 |

### $IO_3^- NO_3^- Ag^+$

$H_2O + HNO_3 + AgIO_3$

$t$ = 25°C (185)

| $M_{HNO_3}$/l* | g $AgIO_3$/l† |
|---|---|
| $AgIO_3$ | |
| 0.00 | 0.0503 |
| 0.125 | 0.0864 |
| 0.250 | 0.1075 |
| 0.500 | 0.1414 |
| 1.000 | 0.2067 |
| 2.000 | 0.3319 |
| 4.000 | 0.6985 |
| 8.000 | 1.5875 |

* Used as solvent.

† Per l of final solution.

### $IO_3^- NO_3^- Pb^{++} K^+$

$H_2O + Pb(IO_3)_2 + KNO_3$

$t$ = 25°C (163)

M per liter

| $\frac{1}{2}Pb(IO_3)_2$ | $KNO_3$ |
|---|---|
| $Pb(IO_3)_2$ | |
| 0.0001102 | 0.0 |
| 0.0001141 | 0.002 |
| 0.0001334 | 0.010 |
| 0.0002037 | 0.050 |

### $IO_3^- NO_3^- La^{+++} Na^+$

$H_2O + La(IO_3)_3 + NaNO_3$

$t$ = 25°C (163)

M per liter

| $\frac{1}{3}La(IO_3)_3$ | $NaNO_3$ |
|---|---|
| $La(IO_3)_3$ | |
| 0.00309 | 0.0 |
| 0.0039277 | 0.025 |
| 0.0044763 | 0.050 |
| 0.0052443 | 0.100 |
| 0.0062619 | 0.200 |
| 0.0073972 | 0.400 |
| 0.0097464 | 0.800 |
| 0.012934 | 1.600 |
| 0.013697 | 3.200 |

### $IO_3^- NH_4^+$

$H_2O + HIO_3 + NH_4IO_3$

$t$ = 30°C (260)

| % $HIO_3$ | % $NH_4IO_3$ |
|---|---|
| $NH_4IO_3$ | |
| 0.0 | 4.20 |
| 2.54 | 3.89 |
| $NH_4IO_3 + NH_4IO_3.2HIO_3$ | |
| 4.53 | 3.81 |
| $NH_4IO_3.2HIO_3$ | |
| 4.73 | 3.53 |
| 6.57 | 1.94 |
| 8.45 | 1.09 |
| 9.12 | 0.89 |
| 24.00 | 0.62 |
| 36.01 | 0.41 |
| 44.43 | 0.39 |
| 58.21 | 0.37 |
| $NH_4IO_3.2HIO_3 + HIO_3$ | |
| 76.35 | 0.31 |
| $HIO_3$ | |
| 76.70 | 0.0 |

### $IO_3^- Pb^{++} K^+$

$H_2O + Pb(IO_3)_2 + KIO_3$

$t$ = 25°C (163)

M per liter

| $\frac{1}{2}Pb(IO_3)_2$ | $KIO_3$ |
|---|---|
| $Pb(IO_3)_2$ | |
| 0.0001102 | 0.0 |
| 0.0000697 | 0.00005304 |
| 0.0000437 | 0.0001061 |

### $IO_3^- La^{+++} Na^+$

$H_2O + La(IO_3)_3 + NaIO_3$

$t$ = 25°C (163)

M per liter

| $\frac{1}{3}La(IO_3)_3$ | $NaIO_3$ |
|---|---|
| $La(IO_3)_3$ | |
| 0.00309 | 0.0 |
| 0.0028718 | 0.0000913 |
| 0.0025521 | 0.0004560 |

**$IO_3^-$ $La^{+++}$ $Na^+$.—(*Cont'd*)**

M per liter

| $\frac{1}{3}La(IO_3)_3$ | $NaIO_3$ |
|---|---|
| $La(IO_3)_3$ | |
| 0.0022976 | 0.000913 |
| 0.0018050 | 0.001826 |
| 0.000892 | 0.003653 |
| 0.0006053 | 0.0045326 |
| 0.00044056 | 0.0067989 |

**$IO_3^-$ $La^{+++}$ $K^+$**

$H_2O + La(IO_3)_3 + KIO_3$

$t = 25°C$ (163)

M per liter

| $\frac{1}{3}La(IO_3)_3$ | $KIO_3$ |
|---|---|
| $La(IO_3)_3$ | |
| 0.003090 | 0.0 |
| 0.0028430 | 0.000099 |
| 0.0025464 | 0.0004957 |
| 0.0022465 | 0.0009914 |
| 0.0016897 | 0.0019828 |

**$IO_3^-$ $Na^+$**

$H_2O + HIO_3 + NaIO_3$

$t = 30°C$ (260)

| % $HIO_3$ | % $NaIO_3$ |
|---|---|
| $NaIO_3.\frac{3}{2}H_2O$ | |
| 0.0 | 9.36 |
| 1.98 | 9.52 |
| 4.86 | 10.22 |
| 5.86 | 11.04 |
| 9.73m | 14.73m |
| $NaIO_3.\frac{3}{2}H_2O + Na_2I_4O_{11}$ | |
| 6.75 | 11.14 |
| $Na_2I_4O_{11}$ | |
| 7.80 | 10.30 |
| 9.93 | 8.71 |
| 11.20 | 7.54 |
| $Na_2I_4O_{11} + NaIO_3.2HIO_3$ | |
| 11.82 | 7.20 |
| $NaIO_3.2HIO_3$ | |
| 14.62 | 5.65 |
| 23.23 | 3.69 |
| 32.68 | 2.91 |
| 40.91 | 2.64 |
| 55.48 | 2.12 |
| 65.47 | 1.83 |
| $NaIO_3.2HIO_3 + HIO_3$ | |
| 76.19 | 1.42 |

**$IO_3^-$ $Na^+$.—(*Continued*)**

| % $HIO_3$ | % $NaIO_3$ |
|---|---|
| $HIO_3$ | |
| 76.70 | 0.0 |

**$IO_3^-$ $K^+$**

$H_2O + HIO_3 + KOH$

$t = 30°C$ (260)

| % $HIO_3$ | % $KIO_3$ |
|---|---|
| $KIO_3$ | |
| 0.0 | 9.51 |
| $KIO_3 + KIO_3.HIO_3$ | |
| 0.65* | 9.47* |
| $KIO_3.HIO_3$ | |
| 0.67 | 6.60 |
| 1.14 | 4.57 |
| 1.69 | 3.63 |
| 2.02 | 3.10 |
| 3.34 | 2.14 |
| 5.00 | 1.32 |
| 6.45m | 1.35m |
| 7.09 | 1.00 |
| $KIO_3.HIO_3 + KIO_3.2HIO_3$ | |
| 8.04 | 0.85 |
| $KIO_3.2HIO_3$ | |
| 9.35 | 0.64 |
| 12.04 | 0.44 |

**$IO_3^-$ $K^+$.—(*Continued*)**

| % $HIO_3$ | % $KIO_3$ |
|---|---|
| $KIO_3.2HIO_3$ | |
| 17.50 | 0.30 |
| 31.20 | 0.52 |
| 62.52 | 0.72 |
| $KIO_3.2HIO_3 + HIO_3$ | |
| 76.40 | 0.80 |
| $HIO_3$ | |
| 76.70 | 0.0 |

* Mean of three results.

**$IO_3^-$ $K^+$**

$H_2O + KOH + KIO_3$

$t = 20°C$ (49)

| $M_{KOH}$/l | $M_{KIO_3}$/l |
|---|---|
| $KIO_3$ | |
| 4.71 | 0.0390 |
| 5.06 | 0.0362 |
| 6.35 | 0.0256 |
| 7.95 | 0.0179 |
| 9.41 | 0.0144 |
| 10.95 | 0.0130 |
| 11.10 | 0.0128 |
| 12.19 | 0.0131 |
| 12.92 | 0.0135 |
| 14.02 | 0.0154 |
| 14.85 | 0.0194 |

**$S^{--}$ $SO_4^{--}$ $Na^+$ (209): $H_2O + Na_2S + Na_2SO_4$**

| Solid phases | Liquid phase | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $t = 0.1°C$ | | $t = 18°C$ | | $t = 25°C$ | | $t = 31°C$ | | $t = 40°C$ | |
| | % $Na_2S$ | % $Na_2SO_4$ | % $Na_2S$ | % $Na_2SO_4$ | % $Na_2S$ | % $Na_2SO_4$ | % $Na_2S$ | % $Na_2SO_4$ | % $Na_2S$ | % $Na_2SO_4$ |
| $Na_2S.10H_2O$ | 11.33 | | | | | | | | | |
| Solid soln. I† | 11.22 | 0.93 | | | | | | | | |
| Solid soln. I† + Solid soln. II‡ | 11.19* | 1.21* | | | | | | | | |
| Solid soln. II‡ | 9.49 | 1.27 | | | | | | | | |
| | 7.36 | 1.48 | | | | | | | | |
| | 4.79 | 1.68 | | | | | | | | |
| | 1.44 | 2.99 | | | | | | | | |
| $Na_2S.9H_2O$ | | | 15.95 | | 17.86 | | 20.60 | | 25.09 | |
| | | | | | 16.61 | 5.01 | 19.57 | 3.04 | 24.06 | 0.49 |
| $Na_2S.9H_2O + Na_2SO_4$ | | | | | | | 19.51 | 4.22 | 23.77* | 1.81* |
| Solid soln. III§ | | | 15.33 | 2.28 | | | | | | |
| | | | 14.50 | 5.20 | | | | | | |
| | | | 13.98 | 6.44 | | | | | | |
| Solid soln. III§ + Solid soln. II‡ | | | 13.89* | 7.21* | | | | | | |
| $Na_2SO_4.10H_2O$ | | | 13.08 | 7.01 | 4.40 | 17.12 | | | | |
| | | | 10.91 | 6.96 | 3.27 | 17.84 | | | | |
| | | | 5.33 | 9.05 | 1.63 | 19.71 | | | | |
| | | | 2.84 | 10.67 | | | | | | |
| $Na_2SO_4.10H_2O + Na_2SO_4$ | | | | | 9.96* | 14.69* | | | | |
| $Na_2SO_4$ | | | | | 14.68 | 8.06 | 22.22 | 2.56 | 23.25 | 1.79 |
| | | | | | 11.21 | 12.56 | 16.36 | 6.58 | 21.91 | 2 44 |
| | | | | | | | 12.14 | 11.56 | 20.36 | 3.41 |
| | | | | | | | 7.47 | 18.92 | 14.97 | 7.37 |
| | | | | | | | 4.81 | 23.06 | 9.78 | 14.14 |
| | | | | | | | | | 6.18 | 20.25 |
| | | | | | | | | | 1.32 | 28.90 |

* Mean of several results.

† Solid soln. I = $Na_2S.10H_2O$ + small concentrations of $Na_2SO_4.10H_2O$.

‡ Solid soln. II = $Na_2SO_4.10H_2O$ + small concentrations of $Na_2S.10H_2O$.

§ Solid soln. III = $Na_2S.9H_2O$ + small concentrations of $Na_2SO_4.9H_2O$.

Transition points

$Na_2S.10H_2O + Na_2S.9H_2O$ + Solution (12.46% $Na_2S$) at 4.7°C.

$Na_2S.10H_2O + Na_2S.9H_2O + Na_2SO_4$ + Solution (11.49% $Na_2SO_4$ + 1.4% $Na_2SO_4$) at 2.3°C.

$Na_2SO_4.10H_2O + Na_2SO_4 + Na_2S.9H_2O$ + Solution (13.41% $Na_2S$ + 9.48% $Na_2SO_4$) at 20.5°C.

$S^{--}$ $Ca^{++}$; *see below*

$SO_3^{--}$ $SO_4^{--}$ $Na^+$ (313)

$H_2O + Na_2SO_3 + Na_2SO_4$; *v.* Fig. 78

| | Solid phases | Liquid phase: $t$ = 0.1°C, % $Na_2SO_3$ | % $Na_2SO_4$ | $t$ = 17.5°C, % $Na_2SO_3$ | % $Na_2SO_4$ | $t$ = 25°C (stable), % $Na_2SO_3$ | % $Na_2SO_4$ |
|---|---|---|---|---|---|---|---|
| A | Solid soln. I*..... | | | 18.87 | 1.82 | | |
| | | | | 18.04 | 3.79 | 21.61 | 4.14 |
| | | | | 17.09 | 5.97 | 19.44 | 8.97 |
| | | 11.59 | 1.11 | 16.55 | 7.59 | 18.27 | 11.05 |
| B | Solid soln. I + Solid soln. II†..... | 11.36 | 1.77 | 16.47 | 7.65 | 16.81 | 14.52 |
| C | Solid soln. II..... | 8.56 | 1.95 | 14.78 | 7.93 | 14.61 | 15.25 |
| | | 5.93 | 2.42 | 11.56 | 8.54 | 11.39 | 16.43 |
| | | 3.07 | 3.11 | 8.48 | 9.89 | 9.22 | 17.31 |
| | | | | 5.99 | 10.61 | 6.59 | 18.11 |
| | | | | 2.61 | 12.15 | 4.11 | 19.66 |
| | | | | | | 2.53 | 20.40 |

| | Solid phases | $t$ = 25°C (metastable), % $Na_2SO_3$ | % $Na_2SO_4$ | $t$ = 37.5°C, % $Na_2SO_3$ | % $Na_2SO_4$ |
|---|---|---|---|---|---|
| D | Solid soln. III‡..... | 27.29 | 1.69 | 27.51 | 1.80 |
| E | | 26.57 | 3.99 | 26.15 | 3.35 |
| | | 25.45 | 6.75 | 25.29 | 4.13 |
| | | | | 24.81 | 5.28 |
| F | Solid soln. IV§..... | 21.88 | 12.34 | 25.78 | 7.14 |
| | | 20.35 | 13.82 | 23.23 | 10.25 |
| | | 18.52 | 16.18 | 21.52 | 12.05 |
| | | 16.94 | 17.82 | 18.13 | 15.24 |
| | | 15.43 | 19.12 | 16.47 | 17.26 |
| G | Solid soln. V‖..... | 14.39 | 20.51 | 8.90 | 25.16 |
| | | | | 14.47 | 20.10 |
| | | | | 9.04 | 24.66 |
| | | | | 6.13 | 27.34 |
| | | | | 4.78 | 28.36 |
| | | | | 2.57 | 30.07 |

* Solid soln. I ($Na_2SO_4.7H_2O$, $Na_2SO_3.7H_2O$).

† Solid soln. II ($Na_2SO_4.10H_2O$, $Na_2SO_3.10H_2O$).

‡ Solid soln. III; § Solid soln. IV; ‖ Solid soln. V; ($Na_2SO_4$, $Na_2SO_3$); varying proportions, limits not given.

$S^{--}$ $Ca^{++}$ (310): $H_2O + H_2S + CaS$

| $t$ = 0°C* g S/l | g $Ca(HS)_2$/l | $t$ = 20°C g S/l | g $Ca(HS)_2$/l |
|---|---|---|---|
| CaS(?) | | | |
| 138.0 | 228.3 | 148.8 | 246.0 |
| 157.0 | 259.4 | 155.0 | 255.8 |
| 169.0 | 278.7 | 159.0 | 262.1 |
| 176.0 | 289.6 | 160.8 | 264.7 |
| 179.0 | 294.1 | 162.0 | 266.6 |
| 181.0 | 297.1 | 165.0 | 271.2 |
| 186.5 | 304.4 | 167.5 | 274.9 |
| 189.5 | 308.4 | 172.0 | 281.8 |
| 193.0 | 312.7 | 173.0 | 283.2 |
| 198.5 | 320.0 | 174.5 | 285.3 |
| $t$ = 20°C | | 178.5 | 291.1 |
| 107.8 | 178.4 | 179.0 | 291.6 |
| 122.2 | 202.3 | 181.5 | 295.6 |
| 132.5 | 219.2 | 182.0 | 296.3 |
| 139.1 | 230.1 | 185.0 | 300.9 |
| 146.9 | 242.9 | | |

$S^{--}$ $Ca^{++}$.—(*Continued*)

| g S/l | g $Ca(HS)_2$/l | g S/l | g $Ca(HS)_2$/l |
|---|---|---|---|
| CaS (?); $t$ = 40°C | | | |
| 79.5 | 131.6 | 150.5 | 248.2 |
| 102.9 | 170.3 | 154.9 | 255.0 |
| 124.9 | 206.9 | 159.6 | 262.1 |
| 134.5 | 222.5 | 164.2 | 269.6 |
| 138.9 | 229.6 | 169.0 | 276.9 |
| 142.1 | 234.7 | 171.0 | 280.0 |
| 146.7 | 242.2 | | |

* Under variable pressure of $H_2S$.

$SO_3^{--}$ $Na^+$ (159): $H_2O + NaOH + Na_2SO_3$

| Solid phases | $t$ = 0.15°C: % NaOH | % $Na_2SO_3$ | $t$ = 20°C: % NaOH | % $Na_2SO_3$ | $t$ = 25°C: % NaOH | % $Na_2SO_3$ | $t$ = 32°C: % NaOH | % $Na_2SO_3$ |
|---|---|---|---|---|---|---|---|---|
| $Na_2SO_3.7H_2O$.. | | 12.2 | | 21.2 | | 23.6 | | |
| | 3.0 | 9.0 | 1.60 | 18.70 | 0.7 | 22.5 | | |
| | 9.0 | 5.2 | 4.40 | 15.40 | 2.5 | 19.3 | | |
| | 16.9 | 2.8 | 9.90 | 11.0 | 5.0 | 17.7 | | |
| | 21.9 | 2.21 | 12.70 | 9.40 | 9.7 | 13.0 | | |
| $Na_2SO_3.7H_2O$ + $Na_2SO_3$..... | 23.3 | 2.20 | 14.00 | 9.00 | 9.8 | 13.2 | | |
| $Na_2SO_3$..... | 25.4 | 1.30 | 15.50 | 7.0 | 12.6 | 10.1 | 0 | 26.5 |
| | 26.6 | 0.7 | 20.2 | 3.5 | 17.2 | 5.8 | 2.3 | 23.1 |
| | 27.1 | 0.4 | 26.8 | 1.0 | 26.7 | 2.5 | 5.1 | 19.1 |
| | 27.9 | 0.1 | 50.1 | Tr. | 29.4 | 3.0 | 11.1 | 11.2 |
| | | | | | | | 16.5 | 5.4 |
| | | | | | | | 20.1 | 2.9 |
| | | | | | | | 27.2 | 0.6 |
| | | | | | | | 36.2 | 1.0 |
| $NaOH.H_2O$.... | 29.5* | | 52.2 | | 53.30 | | 54.4 | |

* Solid $NaOH.4H_2O$.

$SO_4^{--}$ $S_2O_3^{--}$ $Na^+$; *v.* p. 323

$SO_4^{--}$ $HSO_3NO_2$: $H_2O + H_2SO_4 + HNO_3$

$t$ = 0 to 49.6°C (116.5)

Gives data for the solubility of $HSO_3.NO_2$ in solutions of $H_2SO_4$.

$SO_4^{--}$ $NO_3^-$ $NH_4^+$ (390); *cf.* (407)

$H_2O + (NH_4)_2SO_4 + NH_4NO_3$

| Solid phases | Liquid phase: $t$ = 0°C, % $NH_4NO_3$ | % $(NH_4)_2SO_4$ | $t$ = 70°C, % $NH_4NO_3$ | % $(NH_4)_2SO_4$ |
|---|---|---|---|---|
| $(NH_4)_2SO_4$..... | 0 | 41.4 | 0 | 47.81 |
| | 5.61 | 37.89 | 11.10 | 40.81 |
| $(NH_4)_2SO_4$ + $(NH_4)_2SO_4.2NH_4NO_3$..... | 29.58 | 41.64 | 70.15 | 6.71 |
| $(NH_4)_2SO_4.2NH_4NO_3$..... | 29.81 | 21.33 | 71.58 | 5.82 |
| | 31.04 | 20.40 | | |
| $(NH_4)_2SO_4.2NH_4NO_3$ + $(NH_4)_2SO_4.3NH_4NO_3$..... | 30.87 | 20.43 | 73.48 | 5.14 |
| $(NH_4)_2SO_4.3NH_4NO_3$..... | 31.61 | 19.50 | 76.01 | 3.96 |
| | | | 80.25 | 2.68 |
| $(NH_4)_2SO_4.3NH_4NO_3$ + $NH_4NO_3$..... | 45.99 | 9.53 | 81.01 | 2.45 |
| $NH_4NO_3$..... | 49.12 | 6.00 | 81.38 | 2.41 |
| | 54.19 | 0.0 | 84.03 | 0.0 |

$SO_4^{--}$ $NO_3^-$ $NH_4^+$: $H_2O + H_2SO_4 + NH_4NO_3$ (400.5)

### $SO_4^{--}$ $S_2O_3^{--}$ $Na^+$ (144): $H_2O + Na_2SO_4 + Na_2S_2O_3$

| Solid phases | Liquid phase | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t$ = 0.8°C | | $t$ = 18°C | | $t$ = 25°C | | $t$ = 40°C | |
| | % $Na_2SO_4$ | % $Na_2S_2O_3$ | % $Na_2SO_4$ | % $Na_2S_2O_3$ | % $Na_2SO_4$ | % $Na_2S_2O_3$ | % $Na_2SO_4$ | % $Na_2S_2O_3$ |
| $Na_2SO_4.10H_2O$ | 4.60 | | 14.11 | | 21.60 | | | |
| $Na_2SO_4$ | | | | | | | 32.37 | |
| Solid soln. I† | 2.31 | 9.63 | 10.71 | 9.36 | 18.44 | 7.30 | | |
| | 1.87 | 19.62 | 8.45 | 15.86 | 16.13 | 13.22 | | |
| | 1.34 | 30.07 | 7.14 | 22.46 | 13.97 | 19.35 | | |
| | | | 5.97 | 27.00 | 12.97 | 24.96 | | |
| | | | 6.32 | 32.31 | | | | |
| | | | 6.14 | 35.07 | | | | |
| Solid soln. I† + Solid soln. II‡ | 1.19* | 32.75* | 6.26 | 35.42 | | | | |
| Solid soln. II‡ | 1.44 | 32.72 | 6.31 | 35.46 | 4.69 | 39.45 | 2.14 | 49.88 |
| | | | 4.87 | 36.61 | 2.01 | 41.53 | 1.58 | 50.15 |
| | | | 1.65 | 39.12 | | | 0.67 | 50.49 |
| Solid soln. II‡ + Solid soln. III§ | | | | | 5.50* | 38.86* | 2.17* | 49.70 |
| Solid soln. III§ | | | | | 12.15 | 28.0 | 24.79 | 9.06 |
| | | | | | 7.73 | 34.72 | 14.76 | 22.95 |
| | | | | | | | 10.40 | 30.44 |
| | | | | | | | 5.90 | 39.74 |
| | | | | | | | 2.46 | 48.78 |
| Solid soln. I† + Solid soln. III§ | | | | | 12.72* | 26.76* | | |
| $Na_2S_2O_3.5H_2O$ | | 33.57 | | 40.36 | | 43.50 | | 51.23 |

* Mean of several results.
† Solid soln. I = $Na_2SO_4.10H_2O$ + small concentrations of $Na_2S_2O_3.10H_2O$.
‡ Solid soln. II = $Na_2S_2O_3.5H_2O$ + small concentrations of $Na_2SO_4.5H_2O$.
§ Solid soln. III = $Na_2SO_4$ + small concentrations of $Na_2S_2O_3$.

### $SO_4^{--}$ $NO_3^-$ $NH_4^+$ $Ca^{++}$ (62,80)
$H_2O + NH_4NO_3 + CaSO_4$

| % $NH_4NO_3$* | % $CaSO_4$* |
|---|---|
| $t$ = 20°C (80) | |
| 4.667 | 0.6074 |
| 8.490 | 0.7720 |
| 14.346 | 0.9006 |
| 18.883 | 0.9701 |
| 23.229 | 1.0220 |
| 28.211 | 1.0480 |
| 30.905 | 1.0467 |
| 36.089 | 1.0308 |
| $t$ = 27.5°C (80) | |
| 27.544 | 1.0280 |
| 35.932 | 1.0190 |
| 43.616 | 0.9680 |
| 51.148 | 0.8845 |
| 58.303 | 0.7965 |
| 63.814 | 0.7227 |
| $t$ = 25°C (62) | |
| 10 | 3.18 |
| 25 | 3.93 |
| 55 | 5.80 |
| 100 | 7.65 |
| 150 | 8.88 |
| 200 | 9.85 |
| 300 | 10.80 |
| 400 | 11.40 |
| 550 | 12.02 |
| 750 | 12.20 |
| 1000 | 11.81 |
| 1200 | 11.10 |
| 1400 | 10.02 |
| Saturation | 7.55 |

* Solid phase not determined: Probably $CaSO_4.2H_2O$.

### $SO_4^{--}$ $NO_3^-$ $Th^{++++}$
$H_2O + HNO_3 + Th(SO_4)_2$
$t$ = 30°C (235)

| % $HNO_3$ | % $Th(SO_4)_2$ | Solid phase |
|---|---|---|
| 0.0 | 2.15 | $Th(SO_4)_2.8H_2O$ |
| 5.17 | 3.68 | |
| 10.04 | 4.20 | |
| 16.68 | 4.84 | |
| 21.99 | 4.47 | |
| 28.33 | 3.96 | |
| 28.51 | 3.88 | |
| 33.17 | 3.34 | |
| 38.82 | 2.51 | |

### $SO_4^{--}$ $NO_3^-$ $Cu^{++}$ (255)
$H_2O + CuSO_4 + Cu(NO_3)_2$
$t$ = 20°C

| % $Cu(NO_3)_2$ | % $CuSO_4$ | Solid phase |
|---|---|---|
| | | $Cu(NO_3)_2.6H_2O$ |
| 55.94 | 0.0 | |
| 55.18 | 1.14 | $Cu(NO_3)_2.6H_2O + CuSO_4.5H_2O$ |
| | | $CuSO_4.5H_2O$ |
| 40.24 | 1.69 | |
| 34.24 | 2.42 | |
| 11.51 | 7.77 | |
| 0.0 | 17.52 | |
| $t$ = 35°C | | |
| | | $CuSO_4.5H_2O$ |
| 0.0 | 21.00 | |
| 11.37 | 11.04 | |
| 43.10 | 1.62 | |
| 51.90 | 0.86 | |
| 54.67 | 0.79 | |
| 59.11 | 1.02 | |

### $SO_4^{--}$ $NO_3^-$ $Cu^{++}$.—(*Cont'd*)
$t$ = 35°C

| % $Cu(NO_3)_2$ | % $CuSO_4$ | Solid phase | % $Cu(NO_3)_2$ | % $CuSO_4$ | Solid phase |
|---|---|---|---|---|---|
| 60.53 | 1.27 | $CuSO_4.5H_2O + Cu(NO_3)_2.3H_2O$ | 60.92 | 0.0 | $Cu(NO_3)_2.3H_2O$ |

### $SO_4^{--}$ $NO_3^-$ $Cu^{++}$ $Na^+$
$H_2O + Cu(NO_3)_2 + Na_2SO_4$; *v.* Fig. 79
$t$ = 20°C (255)

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | 0.5$Cu(NO_3)_2$ | 0.5$CuSO_4$ | $NaNO_3$ | 0.5$Na_2SO_4$ |
| A | $CuSO_4.5H_2O$ | | 47.92 | | |
| B | $CuSO_4.5H_2O + Cu(NO_3)_2.6H_2O$ | 241.41 | 5.57 | | |
| C | $Cu(NO_3)_2.6H_2O$ | 257.6 | | | |
| D | $Cu(NO_3)_2.6H_2O + NaNO_3$ | 247.14 | | 26.96 | |
| E | $NaNO_3$ | | | 186.32 | |
| F | $NaNO_3 + NaNO_3.Na_2SO_4.H_2O$ | | | 180.02 | 16.0 |
| G | $NaNO_3.Na_2SO_4.H_2O + Na_2SO_4.10H_2O$ | | | 124.68 | 38.59 |
| H | $Na_2SO_4.10H_2O$ | | | | 49.18 |
| I | $Na_2SO_4.10H_2O + CuSO_4.Na_2SO_4.2H_2O$ | | 34.53 | | 53.46 |
| J | $CuSO_4.Na_2SO_4.2H_2O + CuSO_4.5H_2O$ | | 48.32 | | 41.50 |
| | $Na_2SO_4.10H_2O + CuSO_4.Na_2SO_4.2H_2O$ | | 27.42 | 46.89 | 26.81 |
| P | $Na_2SO_4.10H_2O + CuSO_4.Na_2SO_4.2H_2O + NaNO_3.Na_2SO_4.H_2O$ | | 1.16 | 121.79 | 38.03 |
| Q | $NaNO_3 + CuSO_4.Na_2SO_4.2H_2O + NaNO_3.Na_2SO_4.H_2O$ | | 1.52 | 155.22 | 15.53 |
| | $NaNO_3 + CuSO_4.Na_2SO_4.2H_2O$ | 32.00 | | 129.65 | 5.07 |
| | $CuSO_4.Na_2SO_4.2H_2O + CuSO_4.5H_2O$ | 34.74 | | 37.82 | 27.06 |
| R | $CuSO_4.5H_2O + CuSO_4.Na_2SO_4.2H_2O + NaNO_3$ | 55.29 | | 101.68 | 4.75 |
| | $CuSO_4.5H_2O + NaNO_3$ | 86.75 | | 93.70 | 5.38 |
| | | 141.52 | | 73.17 | 3.05 |
| S | $Cu(NO_3)_2.6H_2O + CuSO_4.5H_2O + NaNO_3$ | 243.70 | | 20.14 | 2.5 |

### $SO_4^{--}$ $NO_3^-$ $Ag^+$

$H_2O + HNO_3 + Ag_2SO_4$

$t = 25°C$ (185)

| % $HNO_3$ | % $Ag_2SO_4$ |
|---|---|
| | $Ag_2SO_4$ |
| 0.0 | 0.8330 |
| 5.956 | 3.2126 |
| 11.473 | 4.4276 |
| 21.029 | 5.9949 |
| 21.90 | 6.1234 |
| 27.81 | 6.7926 |
| 39.36 | 7.1042 |
| 45.53 | 6.6398 |

### $SO_4^{--}$ $NO_3^-$ $Mg^{++}$

$H_2O + Mg(NO_3)_2 + MgSO_4$

$t = 25°C$ (217)

| % $Mg(NO_3)_2$ | % $MgSO_4$ |
|---|---|
| | $Mg(NO_3)_2.6H_2O$ |
| 43.25 | 0 |
| 40.76 | 1.02 |
| $Mg(NO_3)_2.6H_2O + MgSO_4.7H_2O$ | |
| 40.15 | 2.77 |
| | $MgSO_4.7H_2O$ |
| 35.07 | 3.62 |
| 25.90 | 6.56 |
| 8.88 | 17.85 |
| 0 | 26.30 |

### $SO_4^{--}$ $NO_3^-$ $Mg^{++}$ $Ca^{++}$

$H_2O + MgSO_4 + Ca(NO_3)_2$

$t = 25°C$ (62, 361)

| % $CaSO_4$ | % $Mg(NO_3)_2$ |
|---|---|
| | $CaSO_4.2H_2O$ |
| 0.2088 | 0 |
| 0.5656 | 2.450 |
| 0.7582 | 4.8086 |
| 0.9197 | 9.2712 |
| 1.1602 | 17.394 |
| 1.1485 | 24.610 |
| 1.1452 | 31.198 |
| 1.1097 | 37.925 |
| $CaSO_4.2H_2O + Mg(NO_3)_2$ | |
| 1.525 | 61.51 |

### $SO_4^{--}$ $NO_3^-$ $Ca^{++}$

$H_2O + H_2SO_4 + Ca(NO_3)_2$

$t = 20°C$ (18)

| g $CaSO_4$/l | g $HNO_3$/l |
|---|---|
| | $CaSO_4.2H_2O$ |
| 4.397 | 6.300 |
| 10.435 | 31.500 |
| 15.147 | 63.000 |
| 20.607 | 126.00 |

### $SO_4^{--}$ $NO_3^-$ $Ca^{++}$

$H_2O + CaSO_4 + Ca(NO_3)_2$

$t = 25°C$ (361)

| % $Ca(NO_3)_2$ | % $CaSO_4$ |
|---|---|
| | $CaSO_4.2H_2O$ |
| 0.00 | 2.088 |
| 24.60 | 1.221 |
| 48.46 | 1.159 |
| 93.69 | 1.062 |
| 175.92 | 0.8171 |
| 249.27 | 0.631 |
| 316.06 | 0.449 |

### $SO_4^{--}$ $NO_3^-$ $Ca^{++}$.—(*Cont'd*)

| % $Ca(NO_3)_2$ | % $CaSO_4$ |
|---|---|
| | $CaSO_4.2H_2O$ |
| 376.48 | 0.304 |
| 402.37 | 0.256 |

### $SO_4^{--}$ $NO_3^-$ $Ca^{++}$ $Na^+$

$H_2O + CaSO_4 + NaNO_3$

$t = 25°C$ (62, 361)

| % $CaSO_4$ | % $NaNO_3$ |
|---|---|
| | $CaSO_4.2H_2O$ |
| 0.2088 | 0.0 |
| 0.4184 | 2.460 |
| 0.5319 | 4.835 |
| 0.6645 | 9.360 |
| 0.7754 | 17.643 |
| 0.7790 | 25.178 |
| 0.5782 | 43.99 |
| 0.5206 | 47.33 |

### $SO_4^{--}$ $NO_3^-$ $Ca^{++}$ $Na^+$ $K^+$

$H_2O + Ca(NO_3)_2 + Na_2SO_4 + K_2SO_4$

$t = 25°C$ (94)

M per 1000M $H_2O$

| $NaNO_3$ | $K_2SO_4$ | $CaSO_4$ |
|---|---|---|
| | | $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O$ |
| 23.39 | 5.685 | 0.457 |

### $SO_4^{--}$ $NO_3^-$ $Ca^{++}$ $K^+$

$H_2O + H_2SO_4 + Ca(NO_3)_2 + K_2SO_4$

$t = 25°C$ (94)

M per 1000M $H_2O$

| $HNO_3$ | $K_2SO_4$ | $CaSO_4$ |
|---|---|---|
| | | $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O$ |
| 7.52 | 6.32 | 0.408 |

### $SO_4^{--}$ $NO_3^-$ $Ca^{++}$ $K^+$

$H_2O + CaSO_4 + KNO_3$

$t = 25°C$ (361)

| % $CaSO_4$ | % $KNO_3$ |
|---|---|
| | $CaSO_4.2H_2O$ |
| 0.2088 | 0 |
| 0.3257 | 1.24 |
| 0.4018 | 2.462 |
| 0.5092 | 4.844 |
| 0.6451 | 9.412 |
| 0.7238 | 13.731 |
| 0.7741 | 17.82 |
| | $CaSO_4.K_2SO_4.H_2O(?)$ |
| ? | 22.53 |

### $SO_4^{--}$ $NO_3^-$ $Ca^{++}$ $K^+$

$H_2O + Ca(NO_3)_2 + K_2SO_4$

$t = 25°C$ (94, 162, 361)

M per 1000M $H_2O$

| $K_2SO_4$ | $CaSO_4$ | $KNO_3$ |
|---|---|---|
| | | $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O + KNO_3$ |
| 2.66 | 0.305 | 2.22 |
| 2.16 | 0.291 | 4.59 |
| $Ca(NO_3)_2$ | | |
| 2.64 | 0.667 | 59.50 |

### $SO_4^{--}$ $NO_3^-$ $Ca^{++}$ $K^+$.—(*Continued*)

| % $CaSO_4$ | % $KNO_3$ |
|---|---|
| | $CaSO_4.2H_2O$* |
| 0.44 | 2.24 |
| 0.55 | 4.51 |
| 0.71 | 9.11 |
| 0.95 | 18.63 |
| 1.12m? | 28.57m? |
| 1.25m? | 38.97m? |
| | $CaSO_4.2H_2O$† |
| 0.2085 | 0 |
| 0.2454 | 0.27824 |
| 0.2727 | 0.53106 |
| 0.2862 | 1.0330 |

* Recalculated from data of (361).
† Data of (162).

### $SO_4^{--}$ $NO_3^-$ $Sr^{++}$

$H_2O + HNO_3 + SrSO_4$

$t = 25°C$ (18)

| $M_{HNO_3}$/l | g $SrSO_4$/l |
|---|---|
| | $SrSO_4$ |
| 0.1 | 0.49 |
| 0.5 | 1.38 |
| 1.0 | 2.17 |
| 2.0 | 3.07 |
| 5.0 | 3.81 |

### $SO_4^{--}$ $NO_3^-$ $Ba^{++}$

$H_2O + H_2SO_4 + Ba(NO_3)_2$

$t = 25°C$ (18)

| $M_{HNO_3}$/l | g $BaSO_4$/l |
|---|---|
| | $BaSO_4$ |
| 0.5 | 0.070 |
| 1.0 | 0.107 |
| 2.0 | 0.170 |
| 5.0 | 0.241 |

### $SO_4^{--}$ $NO_3^-$ $Li^+$ (255): $H_2O + LiNO_3 + Li_2SO_4$; *v.* Fig. 80

| | Solid phases | Liquid phase: % $Li_2SO_4$ | Liquid phase: % $LiNO_3$ |
|---|---|---|---|
| | $t = 25°C$ | 25.79 | |
| | $Li_2SO_4.H_2O$ | 8.12 | 18.64 |
| | | 1.14 | 33.90 |
| | | 0.19 | 43.45 |
| | $Li_2SO_4.H_2O + LiNO_3.3H_2O$ | | 47.60 |
| | $LiNO_3.3H_2O$ | | 47.58 |
| | $t = 35°C$; *v.* Fig. 80 | | |
| A | $Li_2SO_4$ | 24.76 | |
| B | $Li_2SO_4.H_2O + 9Li_2SO_4.LiNO_3.27H_2O$ | 23.85 | 1.48 |
| C | $9Li_2SO_4.LiNO_3.27H_2O + 11Li_2SO_4.LiNO_3.17H_2O$ | 7.50 | 19.12 |
| D | $11Li_2SO_4.LiNO_3.17H_2O + Li_2SO_4.H_2O$ | | 50.55 |
| E | $Li_2SO_4.H_2O + Li_2SO_4$ | | 57.91 |
| F | $Li_2SO_4 + LiNO_3$ | | 62.05 |
| G | $LiNO_3$ | | 61.93 |

### $SO_4^{--}$ $NO_3^-$ $Na^+$; *v.* p. 325

### $SO_4^{--}$ $NO_3^-$ $Na^+$ $K^+$ (158): $H_2O + Na_2SO_4 + KNO_3$; *v.* Fig. 82

| | Solid phases | Liquid phase—M per 1000M $H_2O$: $0.5Na_2SO_4$ | $NaNO_3$ | $0.5K_2SO_4$ | $KNO_3$ |
|---|---|---|---|---|---|
| | $t = 25°C$ (Fig. 82) | | | | |
| A | $K_2SO_4$ | | | 4.49 | |
| B | $K_2SO_4 + K_3Na(SO_4)_2$ | 3.05 | | 4.93 | |
| C | $K_3Na(SO_4)_2 + Na_2SO_4.10H_2O$ | 12.60 | | 3.61 | |
| D | $Na_2SO_4.10H_2O$ | 12.75 | | | |
| E | $Na_2SO_4.10H_2O + Na_2SO_4$ | 11.79 | 14.69 | | |
| F | $Na_2SO_4 + Na_2SO_4.NaNO_3.H_2O$ | 10.77 | 16.54 | | |
| G | $Na_2SO_4.NaNO_3.H_2O + NaNO_3$ | 2.70 | 34.26 | | |
| H | $NaNO_3$ | | 34.78 | | |
| I | $NaNO_3 + KNO_3$ | | 38.47 | | 14.79 |
| J | $KNO_3$ | | | | 12.44 |
| K | $KNO_3 + K_2SO_4$ | | | 2.31 | 10.78 |
| P | $KNO_3 + K_2SO_4 + K_3Na(SO_4)_2$ | | 4.39 | 3.48 | 10.21 |
| Q | $KNO_3 + K_3Na(SO_4)_2 +$ "T"* | | 32.05 | 6.52 | 6.69 |

*Continued on p. 325*

## $SO_4^{--}$ $NO_3^-$ $Na^+$ (255)

$H_2O + NaNO_3 + Na_2SO_4$; *v.* Fig. 81

| | Solid phases | Liquid phase | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 10°C | | $t$ = 20°C | | $t$ = 25°C (Fig. 81) | | $t$ = 30°C | | $t$ = 34°C | |
| | | % $NaNO_3$ | % $Na_2SO_4$ | % $NaNO_3$ | % $Na_2SO_4$ | % $NaNO_3$ | % $Na_2SO_4$ | % $NaNO_3$ | % $Na_2SO_4$ | % $NaNO_3$ | % $Na_2SO_4$ |
| A | $NaNO_3$ | 44.60 | | 46.80 | | 47.47 | | | | 49.31* | |
| | $NaNO_3 + Na_2SO_4.10H_2O$ | 42.54 | 2.96 | | | | | | | | |
| B | $NaNO_3 + NaNO_3.Na_2SO_4.H_2O$ | | | 44.41 | 3.30 | 46.13 | 3.14 | 46.35 | 2.94 | 47.66 | 2.51 |
| C | $NaNO_3.Na_2SO_4.H_2O$ | | | 41.69 | 4.18 | 42.86 | 4.04 | 45.25 | 3.19 | 45.83 | 3.06 |
| | | | | 37.42 | 6.22 | 41.30 | 4.54 | 43.03 | 3.86 | 41.99 | 4.58 |
| | | | | 34.53 | 7.70 | 35.63 | 7.01 | | | | |
| D | $NaNO_3.Na_2SO_4.H_2O + 3NaNO_3.4Na_2SO_4$ | | | | | 33.77 | 8.33 | | | | |
| | | | | | | 32.53 | 9.18 | 41.83 | 4.48 | | |
| | | | | | | | | | | $t$ = 35°C | |
| | $3NaNO_3.2Na_2SO_4 + NaNO_3$ | | | | | | | | | 48.01 | 2.56 |
| | $3NaNO_3.2Na_2SO_4$ | | | | | | | | | 42.06 | 3.35 |
| | $3NaNO_3.2Na_2SO_4 + 3NaNO_3.4Na_2SO_4$ | | | | | | | | | 40.48 | 4.12 |
| | $3NaNO_3.4Na_2SO_4$ | | | | | 26.15 | 13.53 | | | 37.87 | 2.51 |
| E | $3NaNO_3.4Na_2SO_4 + Na_2SO_4$ | | | | | 25.65 | 14.28 | | | 29.77 | 9.52 |
| | $Na_2SO_4$ | | | | | | | | | | 32.54 |
| G | $Na_2SO_4 + Na_2SO_4.10H_2O$ | | | | | 23.34 | 15.68 | | | | |
| | $NaNO_3.Na_2SO_4.H_2O + Na_2SO_4.10H_2O$ | | | 33.80 | 8.74 | | | | | | |
| | $Na_2SO_4.10H_2O$ | 41.20 | 2.87 | 33.75 | 8.63 | 12.96 | 16.67 | | | | |
| | | 32.25 | 3.13 | 9.67 | 13.55 | | 21.88 | | | | |
| H | | | 8.26 | | 16.25 | | | | | | |

* Per cent $NaNO_3$ at 35°C.

## $SO_4^{--}$ $NO_3^-$ $Na^+$ $K^+$.—(*Continued from p. 324*)

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | 0.5$Na_2SO_4$ | $NaNO_3$ | 0.5$K_2SO_4$ | $KNO_3$ |
| | $t$ = 25°C.—*Continued* | | | | |
| R | $KNO_3$ + "T" + $NaNO_3$ | 2.79 | 37.83 | | 15.09 |
| S | $K_2Na(SO_4)_2$ + "T" + $Na_2SO_4.NaNO_3.H_2O$ | | 37.27 | 9.27 | 1.67 |
| U | $NaNO_3$ + "T" + $Na_2SO_4.NaNO_3.H_2O$ | 4.18 | 31.50 | | 2.40 |
| V | $K_2Na(SO_4)_2 + Na_2SO_4 + Na_2SO_4.NaNO_3.H_2O$ | 10.45 | 17.64 | 4.99 | |
| W | $Na_2SO_4 + K_2Na(SO_4)_2 + Na_2SO_4.10H_2O$ | 11.11 | 10.58 | 2.85 | |
| | $t$ = 90°C | | | | |
| | $K_2SO_4$ | | | 4.85 | |
| | $K_2SO_4 + K_2Na(SO_4)_2$ | 5.56 | | 7.35 | |
| | $K_2Na(SO_4)_2 + Na_2SO_4$ | 19.12 | | 4.80 | |
| | $Na_2SO_4$ | 19.47 | | | |
| | $Na_2SO_4 + NaNO_3$ | 2.99 | 57.72 | | |
| | $NaNO_3$ | | 63.33 | | |
| | $NaNO_3 + KNO_3$ | | 83.49 | | 84.60 |
| | $KNO_3$ | | | | 64.67 |
| | $KNO_3 + K_2SO_4$ | | | 0.68 | 63.10 |
| | $KNO_3 + K_2SO_4 + K_3Na(SO_4)_2$ | | 18.61 | 2.64 | 66.12 |
| | $KNO_3 + NaNO_3 + K_2Na(SO_4)_2$ | | 85.58 | 3.69 | 79.04 |
| | $K_2Na(SO_4)_2 + NaNO_3 + Na_2SO_4$ | | 67.05 | 3.00 | 39.10 |

* "T" represents a solid whose composition was not determined.

## $SO_4^{--}$ $NO_3^-$ $K^+$

$H_2O + KNO_3 + K_2SO_4$ (120, 158, 255)

| Solid phases | Liquid phase* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t$ = 15°C | | $t$ = 25°C | | $t$ = 35°C | | $t$ = 90°C | |
| | % $K_2SO_4$ | % $KNO_3$ | % $K_2SO_4$ | % $KNO_3$ | % $K_2SO_4$ | % $KNO_3$ | % $K_2SO_4$ | % $KNO_3$ |
| $K_2SO_4$ | | | 10.74 | 0 | 12.17 | 0 | 18.57 | 0 |
| | | | 8.85 | 4.82 | 6.47 | 16.29 | | |
| | | | 6.89 | 11.05 | | | | |
| $K_2SO_4 + KNO_3$ | 4.35 | 18.35 | 3.94 | 25.49 | 3.39 | 30.76 | 0.63 | 65.92 |
| | | | 4.45 | 23.99 | | | | |
| $KNO_3$ | | | 1.98 | 26.01 | 1.17 | 32.61 | | 66.90 |
| | | | 0 | 27.97 | 0 | 34.76 | | |

* Results for 15 and 25°C from Euler (120) recalculated from g per 100g $H_2O$; for 35°C from Massink; for 25 and 90°C from Hamid.

## $SO_4^{--}$ $NH_4^+$ (96, 107)

$H_2O + H_2SO_4 + NH_4OH$; *v.* Fig. 83

$t$ = 25°C (96)

| | Solid phases | Liquid phase—M per 1000g soln. | |
|---|---|---|---|
| | | $SO_3$ | $(NH_4)_2O$ |
| A | (?) | 10.43 | 0.894 |
| B | $(NH_4)HS_2O_7$ + (?) | 9.67 | 1.260 |
| C | $(NH_4)HS_2O_7$ | 9.60 | 0.977 |
| D | $(NH_4)H_3(SO_4)_2$ | 8.00m | 1.42m |
| | | 7.99 | 1.38 |
| E | $(NH_4)HSO_4 + (NH_4)H_3(SO_4)_2$ | 6.43 | 2.50 |
| F | $(NH_4)HSO_4$ | 6.47 | 1.55 |
| | | 5.66 | 1.22 |
| | | 4.85 | 1.60 |
| G | | 4 29 | 2.17 |

### $SO_4^{--}$ $NH_4^+$.—(*Continued*)

$t$ = 30°C [107]

| % $(NH_4)_2SO_4$ | % $H_2SO_4$ |
|---|---|
| $(NH_4)_2SO_4$ | |
| 43.59 | 10.63 |
| $(NH_4)_2SO_4 + 3(NH_4)_2SO_4.H_2SO_4$ | |
| 42.06 | 16.67 |
| $3(NH_4)_2SO_4.H_2SO_4$ | |
| 44.63 | 32.32 |
| 45.50 | 33.12 |
| $(NH_4)HSO_4$ | |
| 45.31 | 33.96 |
| 35.37 | 38.51 |
| 24.30 | 45.77 |
| 16.98 | 56.55 |
| 24.40 | 62.46 |
| 29.75 | 62.83 |
| 33.70 | 62.59 |
| 36.95 | 62.23 |

### $SO_4^{--}$ $NH_4^+$ [98, 124]

$H_2O + NH_4OH + (NH_4)_2SO_4$

$t$ = 25°C [98]

M per 1000g soln.

| $NH_4OH$ | $(NH_4)_2SO_4$ |
|---|---|
| $(NH_4)_2SO_4$ | |
| 0.0 | 3.28* |
| 2.04 | 2.60 |
| 3.90 | 2.13 |
| 6.88 | 1.59 |
| 10.70 | 1.16 |
| 14.26 | 0.78 |
| 18.94* | 0.0 |

* Work of other investigators.

### $SO_4^{--}$ $NH_4^+$ $C_2O_4^{--}$ [82]

$H_2O + (NH_4)_2SO_4 + (NH_4)_2C_2O_4$

| °C | A* | B† |
|---|---|---|
| 18 | 42.43 | 0.11 |
| 50 | 45.92 | 0.65 |

* A = % $(NH_4)_2SO_4$.

† B = % $(NH_4)_2C_2O_4$. Solid phase is $(NH_4)_2SO_4 + (NH_4)_2C_2O_4.H_2O$.

### $SO_4^{--}$ $NH_4^+$ $HCO_3^-$

$H_2O + (NH_4)_2SO_4 + (NH_4)HCO_3$

$t$ = 15°C [279]

| % $(NH_4)HCO_3$ | % $(NH_4)_2SO_4$ |
|---|---|
| $(NH_4)HCO_3$ | |
| 15.73 | 0.0 |
| 12.66 | 6.96 |
| 11.33 | 10.66 |
| 9.22 | 16.95 |
| 7.88 | 21.48 |
| 6.60 | 26.12 |
| 5.72 | 29.45 |
| 4.73 | 34.04 |
| 3.67 | 38.39 |
| $(NH_4)HCO_3 + (NH_4)_2SO_4$ | |
| 3.69 | 39.90 |
| $(NH_4)_2SO_4$ | |
| 0.0 | 42.44 |

$t$ = 35°C [124]

| % $(NH_4)HCO_3$* | % $(NH_4)_2SO_4$* |
|---|---|
| $(NH_4)HCO_3$ | |
| 23.72 | 0 |
| 15.13 | 18.94 |
| 13.37 | 23.48 |
| 9.79 | 32.64 |
| $(NH_4)HCO_3 + (NH_4)_2SO_4$ | |
| 8.13 | 39.60 |
| $(NH_4)_2SO_4$ | |
| 5.43 | 41.23 |
| 0 | 44.67 |

* Under a pressure of 3 atm. of $CO_2$.

### $SO_4^{--}$ $NH_4^+$ $HCO_3^-$ $Na^+$ [279]*

$H_2O + (NH_4)HCO_3 + Na_2SO_4$; *v.* Figs. 84, 85, 86

| | Solid phases | Liquid phase—M per 1000M $H_2O$: $(NH_4)HCO_3$ | $0.5Na_2SO_4$ | $0.5(NH_4)_2SO_4$ | $NaHCO_3$ |
|---|---|---|---|---|---|
| | $t$ = 15°C; *v.* Fig. 84 | | | | |
| A | $Na_2SO_4.10H_2O$ | | 33.22 | | |
| B | $Na_2SO_4.10H_2O + Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | | 63.08 | 90.28 | |
| C | $Na_2SO_4.(NH_4)_2SO_4.4H_2O + (NH_4)_2SO_4$ | | 27.48 | 189.72 | |
| D | $(NH_4)_2SO_4$ | | | 201.00 | |
| E | $(NH_4)_2SO_4 + (NH_4)HCO_3$ | 14.91 | | 192.8 | |
| F | $(NH_4)HCO_3$ | 42.52 | | | |
| G | $(NH_4)HCO_3 + NaHCO_3$ | 38.92 | | | 12.79 |
| H | $NaHCO_3$ | | | | 18.53 |

### $SO_4^{--}$ $NH_4^+$ $HCO_3^-$ $Na^+$.*—(*Continued*)

| | Solid phases | Liquid phase—M per 1000M $H_2O$: $(NH_4)HCO_3$ | $0.5Na_2SO_4$ | $0.5(NH_4)_2SO_4$ | $NaHCO_3$ |
|---|---|---|---|---|---|
| | $t$ = 15°C.—(*Continued*) | | | | |
| I | $NaHCO_3 + Na_2SO_4.10H_2O$ | | 28.36 | | 12.75 |
| P | $Na_2SO_4.10H_2O + NaHCO_3 + Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | | 52.44 | 91.72 | 12.84 |
| Q | $NaHCO_3 + (NH_4)HCO_3 + Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | | 24.92 | 134.16 | 20.90 |
| R | $(NH_4)HCO_3 + (NH_4)_2SO_4 + Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | | 13.58 | 195.98 | 14.96 |
| | $t$ = 30°C; *v.* Fig. 85 | | | | |
| A | $Na_2SO_4.10H_2O$ | | 104.02 | | |
| B | $Na_2SO_4.10H_2O + Na_2SO_4$ | | 123.26 | 27.50 | |
| C | $Na_2SO_4 + Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | | 110.60 | 66.36 | |
| D | $Na_2SO_4.(NH_4)_2SO_4.4H_2O + (NH_4)_2SO_4$ | | 40.42 | 197.46 | |
| E | $(NH_4)_2SO_4$ | | | 212.4 | |
| F | $(NH_4)_2SO_4 + (NH_4)HCO_3$ | 24.6 | | 198.54 | |
| G | $(NH_4)HCO_3$ | 59.57 | | | |
| H | $(NH_4)HCO_3 + NaHCO_3$ | 37.96 | | | 12.38 |
| I | $NaHCO_3$ | | | | 23.61 |
| J | $NaHCO_3 + Na_2SO_4.10H_2O$ | | 97.68 | | 8.55 |
| P | $NaHCO_3 + Na_2SO_4.10H_2O + Na_2SO_4$ | | 114.50 | 29.16 | 7.09 |
| Q | $Na_2SO_4 + NaHCO_3 + Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | | 110.06 | 63.66 | 7.85 |
| R | $NaHCO_3 + (NH_4)HCO_3 + Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | | 22.54 | 174.08 | 27.56 |
| S | $(NH_4)HCO_3 + (NH_4)_2SO_4 + Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | | 17.36 | 208.12 | 24.66 |
| | $t$ = 40°C | | | | |
| | $Na_2SO_4$ | | 122.02 | | |
| | $Na_2SO_4 + Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | | 102.6 | 94.6 | |
| | $Na_2SO_4.(NH_4)_2SO_4.4H_2O + (NH_4)_2SO_4$ | | 50.0 | 204.8 | |
| | $(NH_4)_2SO_4$ | | | 221.2 | |
| | $(NH_4)_2SO_4 + (NH_4)HCO_3$ | 34.0 | | 201.8 | |
| | $(NH_4)HCO_3$ | 75.77 | | | |
| | $(NH_4)HCO_3 + NaHCO_3$ | 70.83 | | | 15.84 |
| | $NaHCO_3$ | | | | 26.92 |
| | $NaHCO_3 + Na_2SO_4$ | | 114.28 | | 9.45 |
| | $Na_2SO_4 + NaHCO_3 + Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | | 98.66 | 90.82 | 11.26 |
| | $NaHCO_3 + (NH_4)HCO_3 + Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | | 20.06 | 218.2 | 34.59 |
| | $(NH_4)HCO_3 + (NH_4)_2SO_4 + Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | | 19.58 | 218.4 | 35.49 |
| | $t$ = 15°C [124] | | | | |
| | $Na_2SO_4.10H_2O$ | | | | 1.86 |
| | $Na_2SO_4.10H_2O + NH_4NaSO_4.3H_2O$† | | 4.96 | | 3.70 |
| | $NH_4NaSO_4.3H_2O + (NH_4)_2SO_4$ | | 10.56 | | 1.80 |
| | $(NH_4)_2SO_4$ | | 11.12 | | |
| | $t$ = 35°C [124]‡; (*v.* Fig. 86) | | | | |
| A | $Na_2SO_4$ | | | | 6.98 |
| B | $Na_2SO_4 + NH_4NaSO_4.3H_2O$ | | 4.66 | | 5.92 |
| C | $NH_4NaSO_4.3H_2O + (NH_4)_2SO_4$ | | 11.08 | | 2.82 |
| D | $(NH_4)_2SO_4$ | | 12.22 | | |
| E | $(NH_4)_2SO_4 + (NH_4)HCO_3$ | 1.96 | 10.48 | | |

**$SO_4^{--}$ $NH_4^+$ $HCO_3^-$ $Na^+$.***—(*Continued*)

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | $(NH_4)HCO_3$ | $0.5Na_2SO_4$ | $0.5(NH_4)_2SO_4$ | $NaHCO_3$ |
| | *t* = 35°C.—(*Continued*) | | | | |
| F | $(NH_4)HCO_3$ | 3.93 | | | |
| G | $(NH_4)HCO_3$ + $NaHCO_3$ | 3.72 | | 0.84 | |
| | | 1.82 | 3.43 | 1.39 | |
| | | | 8.86 | 2.20 | |
| P | $NaHCO_3$ + $NH_4NaSO_4.3H_2O$ + $Na_2SO_4$ | | 4.56 | 0.50 | 5.41 |
| | $NaHCO_3$+$NH_4NaSO_4.3H_2O$ | | 6.54 | 0.80 | 3.56 |
| | | | 8.89 | 1.27 | 2.11 |
| Q | $NaHCO_3$ + $(NH_4)_2SO_4$ + $NH_4NaSO_4.3H_2O$ | | 11.18 | 1.76 | 1.25 |
| R | $(NH_4)HCO_3$ + $NaHCO_3$ + $(NH_4)_2SO_4$ | | 11.34 | 1.90 | 1.08 |

* All determinations made under decomposition pressure of $(NH_4)HCO_3$.
† The correct formula of this salt is probably that given by Nishizawa, namely, $(NH_4)_2SO_4.Na_2SO_4.4H_2O$. ‡ Under pressure of 3 atm. $CO_2$.

**$SO_4^{--}$ $NH_4^+$ $C_2H_3O_2^-$ $Pb^{++}$**
$H_2O$ + $NH_4C_2H_3O_2$ + $PbSO_4$
*t* = 25°C (254)

| % $NH_4C_2H_3O_2$* | % $PbSO_4$† |
|---|---|
| | $PbSO_4$ |
| 0.00 | 0.0041 |
| 0.796 | 0.0636 |
| 1.591 | 0.137 |
| 3.170 | 0.304 |
| 5.340 | 0.560 |
| 10.69 | 1.680 |
| 21.37 | 3.890 |

**$SO_4^{--}$ $NH_4^+$ $C_2H_3O_2^-$ $Ca^{++}$**
$H_2O$ + $NH_4C_2H_3O_2$ + $CaSO_4$
*t* = 25°C (254)

| % $NH_4C_2H_3O_2$* | % $CaSO_4$† |
|---|---|
| | $CaSO_4.2H_2O$ |
| 0.0 | 0.2085 |
| 2.13 | 0.454 |
| 5.34 | 0.752 |
| 10.68 | 1.146 |
| 21.37 | 1.755 |

**$SO_4^{--}$ $NH_4^+$ $C_2H_3O_2^-$ $Sr^{++}$**
$H_2O$ + $NH_4C_2H_3O_2$ + $SrSO_4$
*t* = 25°C (254)

| % $NH_4C_2H_3O_2$* | % $SrSO_4$† |
|---|---|
| | $SrSO_4$ |
| 0.00 | 0.0151 |
| 2.13 | 0.0451 |
| 5.34 | 0.0732 |
| 10.68 | 0.0942 |
| 21.37 | 0.1150 |

**$SO_4^{--}$ $NH_4^+$ $Th^{++++}$**
$H_2O$ + $(NH_4)_2SO_4$ + $Th(SO_4)_2$
*t* = 16°C (21)

| g per 100g $H_2O$ | |
|---|---|
| $(NH_4)_2SO_4$ | $Th(SO_4)_2$ |
| | $Th(SO_4)_2.?H_2O$ |
| 2.13 | 3.361 |
| 4.80 | 5.269 |
| 10.02 | 8.947 |
| 16.56 | 13.33 |
| 28.00 | 10.359 |
| 35.20 | 9.821 |
| 45.14 | 6.592 |
| 49.05 | 5.750 |
| 52.88 | 4.583 |
| 69.74 | 1.653 |

**$SO_4^{--}$ $NH_4^+$ $Zn^{++}$ $Cu^{++}$**
$H_2O$ + $(NH_4)_2SO_4$ + $ZnSO_4$ + $CuSO_4$; *t* = 13–14°C (129)

| Solid phase—M% | | Liquid phase—M per 1000M $H_2O$ | |
|---|---|---|---|
| $(NH_4)_2SO_4$.-$CuSO_4.6H_2O$ | $(NH_4)_2SO_4$.-$ZnSO_4.6H_2O$ | $(NH_4)_2SO_4$.-$CuSO_4.6H_2O$ | $(NH_4)_2SO_4$.-$ZnSO_4.6H_2O$ |
| 2.39 | 97.61 | 0.422 | 8.069 |
| 4.52 | 95.48 | 0.666 | 5.638 |
| 9.03 | 90.97 | 1.218 | 5.115 |
| 14.67 | 85.33 | 2.130 | 4.924 |
| 22.62 | 77.38 | 3.216 | 4.022 |
| 100.0 | 0.0 | 10.350 | 0.0 |

* Before saturation. † After saturation.

**$SO_4^{--}$ $NH_4^+$ $Cu^{++}$ (73, 335, 338): $H_2O$ + $(NH_4)_2SO_4$ + $CuSO_4$**

| Solid phases | Liquid phase—M per 1000g $H_2O$ (73) | | | | | |
|---|---|---|---|---|---|---|
| | *t* = 25°C | | *t* = 51°C | | *t* = 61°C | |
| | $CuSO_4$ | $(NH_4)_2SO_4$ | $CuSO_4$ | $(NH_4)_2SO_4$ | $CuSO_4$ | $(NH_4)_2SO_4$ |
| $CuSO_4.5H_2O$ | 1.410 | | 2.073 | | 2.419 | |
| | 1.470 | 0.096 | | | | |
| | 1.486 | 0.121 | | | | |
| | 1.494 | 0.158 | | | | |
| | 1.513 | 0.183 | | | | |
| | 1.558 | 0.293 | | | | |
| $CuSO_4.5H_2O$ + $CuSO_4.(NH_4)_2SO_4.6H_2O$ | 1.646 | 0.534 | 2.365 | 0.861 | 2.753 | 0.998 |
| $CuSO_4.(NH_4)_2SO_4.6H_2O$ | 1.413 | 0.572 | 1.302 | 1.351 | 1.631 | 1.695 |
| | 1.368 | 0.575 | | | 0.396 | 5.387 |
| | 1.259 | 0.601 | | | | |
| | 0.779 | 0.779 | | | | |
| | 0.565 | 0.897 | | | | |
| | 0.507 | 0.989 | | | | |
| | 0.112 | 3.233 | | | | |
| $CuSO_4.(NH_4)_2SO_4.6H_2O$ + $(NH_4)_2SO_4$ | 0.070 | 3.826 | 0.180 | 6.733 | 0.249 | 7.079 |
| $(NH_4)_2SO_4$ | 0.051 | 5.715 | | 6.462 | | 6.714 |
| | 0.042 | 5.762 | | | | |
| | | 5.801 | | | | |

| °C (335) | Solid phases | Liquid phase—M per 100M $H_2O$ | |
|---|---|---|---|
| | | $(NH_4)_2SO_4$ | $CuSO_4$ |
| − 1.5 | $CuSO_4.5H_2O$ + Ice | | 1.31 |
| − 2.6 | $CuSO_4.5H_2O$ + $(NH_4)_2SO_4$.-$CuSO_4.6H_2O$ + Ice | 0.24 | 1.88 |
| − 1.7 | $CuSO_4.(NH_4)_2SO_4.6H_2O$+Ice. | 0.68 | 0.68 |
| − 4.2 | | 2.33 | 0.102 |
| − 7.2 | | 3.80 | 0.05 |
| −19.0 | $(NH_4)_2SO_4$ + $(NH_4)_2SO_4.CuSO_4$.-$6H_2O$ + Ice | 9.7 | |

*t* = 30°C (338)

| % $(NH_4)_2SO_4$ | % $CuSO_4$ | % $(NH_4)_2SO_4$ | % $CuSO_4$ |
|---|---|---|---|
| $(NH_4)_2SO_4$ | | $(NH_4)_2SO_4.CuSO_4.6H_2O$ | |
| 44.00 | 0.0 | 8.19 | 13.65 |
| $(NH_4)_2SO_4$ + $(NH_4)_2SO_4$.-$CuSO_4.6H_2O$ | | 6.98 | 16.77 |
| | | $(NH_4)_2SO_4.CuSO_4.6H_2O$ + $CuSO_4.5H_2O$ | |
| 43.29 | 0.49 | | |
| $(NH_4)_2SO_4.CuSO_4.6H_2O$ | | 5.79 | 20.53 |
| 38.32 | 0.77 | $CuSO_4.5H_2O$ | |
| 29.27 | 1.57 | | |
| 17.53 | 4.05 | 2.45 | 20.19 |
| 9.33 | 11.03 | 0.9 | 20.32 |

**$SO_4^{--}$ $NH_4^+$ $Cu^{++}$ $Ni^{++}$**
$H_2O$ + $(NH_4)_2SO_4$ + $CuSO_4$ + $NiSO_4$
*t* = 13–14°C (129)

| Solid phase—M% | | Liquid phase—M per 1000M $H_2O$ | |
|---|---|---|---|
| $(NH_4)_2SO_4$.-$CuSO_4.6H_2O$ | $(NH_4)_2SO_4$.-$NiSO_4.6H_2O$ | $(NH_4)_2SO_4$.-$CuSO_4.6H_2O$ | $(NH_4)_2SO_4$.-$NiSO_4.6H_2O$ |
| 0.00 | 100.00 | 0.00 | 5.210 |
| 3.51 | 96.49 | 0.576 | 3.450 |
| 10.29 | 89.71 | 1.476 | 2.950 |
| 30.59 | 69.41 | 2.664 | 2.089 |
| 44.26 | 55.47 | 3.693 | 1.809 |

$SO_4^{--}$ $NH_4^+$ $Cu^{++}$ $Ni^{++}$.—*(Continued)*

| Solid phase—M % | | Liquid phase—M per 1000M $H_2O$ | |
|---|---|---|---|
| $(NH_4)_2SO_4$.-$CuSO_4.6H_2O$ | $(NH_4)_2SO_4$.-$NiSO_4.6H_2O$ | $(NH_4)_2SO_4$.-$CuSO_4.6H_2O$ | $(NH_4)_2SO_4$.-$NiSO_4.6H_2O$ |
| 52.23 | 47.77 | 4.165 | 1.449 |
| 76.73 | 23.27 | 4.631 | 1.251 |
| 78.80 | 21.20 | 4.785 | 1.202 |
| 100.00 | 0.00 | 10.350 | 0.00 |

$SO_4^{--}$ $NH_4^+$ $Cu^{++}$ $Li^+$

$H_2O + (NH_4)_2SO_4 + CuSO_4 + Li_2SO_4$; *v.* Fig. 87

$t = 30°C$ (338)

| | Solid phases | Liquid phase | | |
|---|---|---|---|---|
| | | % $(NH_4)_2SO_4$ | % $CuSO_4$ | % $Li_2SO_4$ |
| A | $(NH_4)_2SO_4$ | 44.0 | | |
| B | $(NH_4)_2SO_4 + (NH_4)_2SO_4.CuSO_4.6H_2O$ | 43.29 | 0.49 | |
| C | $(NH_4)_2SO_4.CuSO_4.6H_2O + CuSO_4.5H_2O$ | 2.79 | 20.53 | |
| D | $CuSO_4.5H_2O$ | | 20.32 | |
| E | $CuSO_4.5H_2O + Li_2SO_4.H_2O$ | | 10.05 | 20.55 |
| F | $Li_2SO_4.H_2O$ | | | 25.24 |
| G | $Li_2SO_4.H_2O + NH_4LiSO_4$ | 12.46 | | 21.88 |
| H | $NH_4LiSO_4 + (NH_4)_2SO_4$ | 39.55 | | 6.59 |
| P | $(NH_4)_2SO_4 + NH_4LiSO_4 + (NH_4)_2SO_4.CuSO_4.6H_2O$ | 39.98 | 0.37 | 6.18 |
| Q | $NH_4LiSO_4 + Li_2SO_4.H_2O + (NH_4)_2SO_4.CuSO_4.6H_2O$ | 12.56 | 2.51 | 20.51 |
| R | $Li_2SO_4.H_2O + CuSO_4.5H_2O + (NH_4)_2SO_4.CuSO_4.6H_2O$ | 5.14 | 10.68 | 18.08 |

$SO_4^{--}$ $NH_4^+$ $Cu^{++}$ $K^+$

$H_2O + (NH_4)_2SO_4 + CuSO_4 + K_2SO_4$; *v.* Fig. 88

$t = 25°C$ (169)

| | Solid phases | Liquid phase—M per 100M of dissolved salts | | | |
|---|---|---|---|---|---|
| | | $(NH_4)_2SO_4$ | $CuSO_4$ | $K_2SO_4$ | $H_2O$ |
| A | $CuSO_4.5H_2O + CuSO_4.(NH_4)_2SO_4.6H_2O$ | 24.86 | 75.14 | | 2570 |
| | $CuSO_4.5H_2O$ + Solid soln. I* | 22.68 | 75.63 | 1.69 | 2589 |
| | | 19.89 | 77.02 | 3.09 | 2640 |
| | | 16.30 | 87.38 | 5.32 | 2717 |
| | | 13.15 | 79.62 | 7.23 | 2778 |
| | | 8.56 | 83.14 | 8.30 | 2907 |
| | | 4.41 | 85.23 | 10.36 | 3011 |
| B | $CuSO_4.5H_2O + CuSO_4.K_2SO_4.6H_2O$ | | 88.22 | 11.78 | 3149 |
| C | $(NH_4)_2SO_4 + CuSO_4.(NH_4)_2SO_4.6H_2O$ | 99.30 | 0.70 | | 955 |
| | Solid soln. I* + Solid soln. II† | 92.39 | 0.88 | 6.73 | 1071 |
| | | 82.56 | 2.20 | 15.24 | 1604 |
| | | 71.66 | 3.59 | 24.75 | 2140 |
| | | 56.02 | 5.60 | 38.38 | 3091 |
| | | 43.01 | 7.28 | 49.76 | 3922 |
| | | 31.35 | 8.46 | 60.19 | 4628 |
| | | 15.26 | 9.93 | 74.81 | 5610 |
| D | $K_2SO_4 + CuSO_4.K_2SO_4.6H_2O$ | | 11.27 | 88.73 | 6741 |

* Solid soln. I $CuSO_4.(K, NH_4)_2SO_4.6H_2O$. † Solid soln. II $(K, NH_4)_2SO_4$.

$SO_4^{--}$ $NH_4^+$ $Fe^{++}$

$H_2O + (NH_4)_2SO_4 + FeSO_4$; *v.* Fig. 89

$t = 30°C$ (343)

| | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % $(NH_4)_2SO_4$ | % $FeSO_4$ |
| A | $FeSO_4.7H_2O$ | 5.24 | 24.90 |
| | | | 25.24 |
| B | $(NH_4)_2SO_4.FeSO_4.6H_2O + FeSO_4.7H_2O$ | 5.91* | 25.24* |

$SO_4^{--}$ $NH_4^+$ $Fe^{++}$.—*(Continued)*

| | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % $(NH_4)_2SO_4$ | % $FeSO_4$ |
| C | $(NH_4)_2SO_4.FeSO_4.6H_2O$ | 6.44 | 23.59 |
| | | 8.90 | 17.64 |
| | | 11.45 | 13.13 |
| | | 16.29 | 7.95 |
| D | | 19.64 | 5.70 |
| | | 34.24 | 1.72 |
| E | $(NH_4)_2SO_4 + (NH_4)_2SO_4.FeSO_4.6H_2O$ | 43.88* | 0.79* |
| F | $(NH_4)_2SO_4$ | 44.27 | |

* Average of two or more results.

$SO_4^{--}$ $NH_4^+$ $Fe^{++}$ $Mg^{++}$ (403)

$H_2O + (NH_4)_2SO_4 + FeSO_4 + MgSO_4$

Author determined the solubilities of solid solutions of $(NH_4)_2SO_4.MgSO_4.6H_2O$ and $(NH_4)_2SO_4.FeSO_4.6H_2O$ between 0 and 6°C. He found that these compounds form a continuous series of solid solutions and that the ratio of the two solids in these solid solutions was nearly the same as the ratio of the component salts in the solution with which these solids were in equilibrium.

$SO_4^{--}$ $NH_4^+$ $Fe^{++}$ $Li^+$

$H_2O + (NH_4)_2SO_4 + FeSO_4 + Li_2SO_4$; *v.* Fig. 90

$t = 30°C$ (343)

| | Solid phases | Liquid phase | | |
|---|---|---|---|---|
| | | % $(NH_4)_2SO_4$ | % $FeSO_4$ | % $Li_2SO_4$ |
| A | $FeSO_4.7H_2O$ | | 24.87 | |
| B | $FeSO_4.7H_2O + Li_2SO_4.H_2O$ | | 16.10 | 16.50 |
| C | $Li_2SO_4.H_2O$ | | | 25.10 |
| D | $Li_2SO_4.H_2O + LiNH_4SO_4$ | 12.46 | | 21.88 |
| E | $LiNH_4SO_4 + (NH_4)_2SO_4$ | 39.55 | | 6.59 |
| F | $(NH_4)_2SO_4$ | 44.27 | | |
| G | $(NH_4)_2SO_4 + (NH_4)_2SO_4.FeSO_4.6H_2O$ | 43.86 | 0.79 | |
| H | $(NH_4)_2SO_4.FeSO_4.6H_2O + FeSO_4.7H_2O$ | 5.93 | 25.22 | |
| P | $FeSO_4.7H_2O + Li_2SO_4.H_2O + (NH_4)_2SO_4.FeSO_4.6H_2O$ | 4.82 | 16.85 | 15.62 |
| Q | $Li_2SO_4.H_2O + (NH_4)_2SO_4.FeSO_4.6H_2O + NH_4LiSO_4$ | 12.32 | 4.15 | 20.03 |
| R | $(NH_4)_2SO_4.FeSO_4.6H_2O + NH_4LiSO_4 + (NH_4)_2SO_4$ | 40.48 | 0.61 | 6.23 |

$SO_4^{--}$ $NH_4^+$ $CrO_4^{--}$

$H_2O + (NH_4)_2SO_4 + (NH_4)_2CrO_4$

$t = 25°C$ (10)

| Solid phases | Liquid phase | | |
|---|---|---|---|
| | M % $(NH_4)_2CrO_4$ | % $(NH_4)_2SO_4$ | % $(NH_4)_2CrO_4$ |
| $(NH_4)_2SO_4$ | 0 | 43.41 | 0.0 |
| Solid soln. I* | 2.68 | 39.73 | 3.67 |
| Solid soln. II† | 5.98 | 39.13 | 4.22 |
| | 8.47 | 39.11 | 4.23 |
| | 18.86 | 39.96 | 4.36 |
| | 25.88 | 37.72 | 4.51 |
| | 40.25 | 38.06 | 4.88 |
| | 60.25 | 34.82 | 6.98 |
| | 82.26 | 30.81 | 9.06 |
| | 92.57 | 26.81 | 11.73 |
| | 96.91 | 17.13 | 16.76 |
| | 98.91 | 14.97 | 17.76 |
| | 99.81 | 2.78 | 23.22 |
| $(NH_4)_2CrO_4$ | 100.00 | 0.0 | 25.16 |

* Solid soln. I contains from 0 to 2.90M % $(NH_4)_2CrO_4$.

† Solid soln. II contains from about 21.5 to 100M % $(NH_4)_2CrO_4$.

$SO_4^{--}$ $NH_4^+$ $CrO_4^{--}$ $K^+$

$H_2O + (NH_4)_2SO_4 + K_2CrO_4$

$t = 25°C$ (215.5)

Composition of liquid phase in moles, in equilibrium with two solid solutions (I and II), also in moles

| Solid soln. I | | | | Solid soln. II | | | | Liquid phase | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $(NH_4)_2$ | $K_2$ | $SO_4$ | $CrO_4$ | $(NH_4)_2$ | $K_2$ | $SO_4$ | $CrO_4$ | $(NH_4)_2$ | $K_2$ | $SO_4$ | $CrO_4$ | $H_2O$ |
| 100 | 0 | 97.1 | 2.9 | 100 | 0 | 78.5 | 21.5 | 100 | 0 | 91.44 | 8.56 | 971 |
| 73.75 | 26.25 | 92.29 | 7.71 | 98.28 | 1.72 | 11.88 | 88.12 | 91.51 | 8.49 | 79.37 | 20.63 | 1064 |
| 42.14 | 57.86 | 88.89 | 11.11 | 96.72 | 3.28 | 11.37 | 88.63 | 88.12 | 11.88 | 69.32 | 30.68 | 1246 |
| 24.15 | 75.85 | 84.93 | 15.07 | 92.86 | 7.14 | 9.39 | 90.61 | 77.30 | 22.70 | 41.15 | 58.85 | 1485 |
| 21.07 | 78.93 | 77.32 | 22.68 | 89.86 | 10.14 | 7.17 | 92.83 | 66.05 | 33.95 | 21.29 | 78.71 | 1485 |
| 17.57 | 82.43 | 71.66 | 58.59 | 69.42 | 30.58 | 6.40 | 93.60 | 59.51 | 40.49 | 14.19 | 85.81 | 1501 |
| 37.56 | 62.44 | 41.41 | 85.39 | 60.20 | 39.81 | 9.38 | 91.67 | 52.04 | 47.96 | 9.79 | 90.21 | 1508 |
| 37.41 | 62.59 | 14.61 | | 48.16 | 51.84 | 7.83 | 92.17 | 42.61 | 57.39 | 7.59 | 92.41 | 1571 |
| | | | | 49.76 | 50.24 | 3.30 | 96.70 | 45.17 | 54.83 | 3.63 | 96.37 | 1524 |
| 16.76 | 83.24 | 0 | 100 | 55.50 | 44.50 | 100 | 0 | 61.66 | 38.34 | 0 | 100 | 1682 |

$SO_4^{--}$ $NH_4^+$ $B_4O_7^{--}$ (326, 331)

$H_2O + (NH_4)_2SO_4 + (NH_4)_2B_4O_7$

| Solid phases | Liquid phase | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $t = 10°C$ | | $t = 20°C$ | | $t = 25°C$ | | $t = 35°C$ | | $t = 50°C$ | |
| | % $(NH_4)_2B_4O_7$ | % $(NH_4)_2SO_4$ | % $(NH_4)_2B_4O_7$ | % $(NH_4)_2SO_4$ | % $(NH_4)_2B_4O_7$ | % $(NH_4)_2SO_4$ | % $(NH_4)_2B_4O_7$ | % $(NH_4)_2SO_4$ | % $(NH_4)_2B_4O_7$ | % $(NH_4)_2SO_4$ |
| | 5.26 | | 7.63* | | 9.00 | | 13.02 | | 20.88 | |
| $(NH_4)_2B_4O_7.4H_2O$ | 3.02 | 8.29 | 6.39 | 3.25 | 6.75 | 5.17 | 11.80 | 1.59 | 13.73 | 16.31 |
| | 1.81 | 37.09 | 4.35 | 11.97 | 4.05 | 23.87 | 7.41 | 14.92 | 10.01 | 31.29 |
| | | | 2.48 | 38.37 | 3.14* | 37.19* | 5.88* | 25.19* | | |
| $(NH_4)_2B_4O_7.4H_2O + (NH_4)_2SO_4$ | 1.61* | 41.09* | 2.36* | 41.41* | 2.83* | 41.62* | 4.21* | 41.56* | 8.55* | 41.19* |
| | | 42.20 | | 42.99 | 2.02 | 42.17 | 1.69* | 43.17* | 8.63 | 41.11 |
| $(NH_4)_2SO_4$ | | | | | 0.65* | 43.06* | | 44.23* | | 45.77 |
| | | | | | | 43.42* | | | | |

* Mean of more than one determination.

Invariant points

| °C | Solid phases | % $(NH_4)_2B_4O_7$ | % $(NH_4)_2SO_4$ |
|---|---|---|---|
| − 1.07 | $(NH_4)_2B_4O_7.4H_2O$ + Ice | 3.62 | |
| −19.91 | $(NH_4)_2SO_4 + (NH_4)_2B_4O_7.4H_2O$ + Ice | 0.78 | 39.38 |
| −19.05 | $(NH_4)_2SO_4$ + Ice | | 39.75 |

$SO_4^{--}$ $NH_4^+$ $B_4O_7^{--}$ $Na^+$; *v.* p. 330, 331

$SO_4^{--}$ $NH_4^+$ $La^{+++}$; $SO_4^{--}$ $NH_4^+$ $Ce^{+++}$; $SO_4^{--}$ $NH_4^+$ $Sa^{+++}$; *v.* p. 331

$SO_4^{--}$ $NH_4^+$ $Gl^{++}$ ($Be^{++}$)

$H_2O + (NH_4)_2SO_4 + GlSO_4$ ( = $BeSO_4$)

$t = 25°C$ (43); *v.* Fig. 94

| | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % $(NH_4)_2SO_4$ | % $GlSO_4$ |
| A | | 43.45 | 0 |
| | $(NH_4)_2SO_4$ | 38.60 | 8.62 |
| B | | 35.88 | 16.04 |
| C | $(NH_4)_2SO_4 + (NH_4)_2SO_4.GlSO_4.2H_2O$ | 37.56 | 19.72 |
| | | 34.26 | 22.08 |
| | $(NH_4)_2SO_4.GlSO_4.2H_2O$ | 32.20 | 24.04 |
| D | $(NH_4)_2SO_4.GlSO_4.2H_4O + GlSO_4.4H_2O$ | 28.09 | 26.79 |
| | | 24.99 | 26.68 |
| E | $GlSO_4.4H_2O$ | 15.66 | 27.26 |
| | | 5.77 | 28.56 |
| F | | 0 | 29.94 |

$SO_4^{--}$ $NH_4^+$ $Mg^{++}$ (393)

$H_2O + (NH_4)_2SO_4 + MgSO_4$; *v.* Fig. 95

| | Solid phases | Liquid phase | | | |
|---|---|---|---|---|---|
| | | $t = 30°C$ | | $t = 60°C$ | |
| | | % $(NH_4)_2SO_4$ | % $MgSO_4$ | % $(NH_4)_2SO_4$ | % $MgSO_4$ |
| A | $(NH_4)_2SO_4$ | 43.60 | 0.0 | 46.80 | 0.0 |
| B* | $(NH_4)_2SO_4$ + $(NH_4)_2SO_4.MgSO_4.6H_2O$ | | | | |
| C | | 41.20 | 0.30 | | |
| D | | 26.15 | 1.25 | 26.77 | 4.68 |
| E | | 19.17 | 3.01 | 24.37 | 5.06 |
| F | | 10.55 | 7.30 | 14.27 | 11.92 |
| G | $(NH_4)_2SO_4.MgSO_4.6H_2O$ | 9.57 | 8.71 | 13.88 | 12.65 |
| H | | 8.97 | 9.66 | 11.91 | 15.04 |
| I | | 6.31 | 16.53 | 5.85 | 26.85 |
| J | | 4.55 | 20.20 | 3.98 | 31.10 |
| K | | 2.98 | 27.60 | | |
| L* | $MgSO_4.7H_2O + (NH_4)_2SO_4.MgSO_4.6H_2O$ | | | | |
| M | $MgSO_4.7H_2O$ | 0.0 | 29.03 | 0.0 | 35.24 |

* Not realized experimentally: position on diagram indicated roughly.

## $SO_4^{--}$ $NH_4^+$ $B_4O_7^{--}$ $Na^+$ (325, 326, 328, 332)

$H_2O + (NH_4)_2SO_4 + Na_2B_4O_7$; *v.* Figs. 91, 92, 93

Liquid phase—M per 1000M $H_2O$†

| | Solid phases | $t = -16°C$ | | | | $t = -10°C$ | | | | $t = 0°C$ (*v.* Fig. 91) | | | | $t = 10°C$ | | | | $t = 15°C$ | | | | $t = 25°C$ (*v.* Fig. 92) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.5A | 0.5B | 0.5C | 0.5D | 0.5A | 0.5B | 0.5C | 0.5D | 0.5A | 0.5B | 0.5C | 0.5D | 0.5A | 0.5B | 0.5C | 0.5D | 0.5A | 0.5B | 0.5C | 0.5D | 0.5A | 0.5B | 0.5C | 0.5D |
| F | $(NH_4)_2SO_4$ | | | | | | | | | 186.0 | | | | 192.41 | | | | 199.07 | | | | 202.22 | | | |
| | $(NH_4)_2SO_4 + Na_2SO_4.10H_2O$ + $Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | 182.8 | | | | | | | | | | | | | | | | | | | | | | | |
| | $(NH_4)_2SO_4 + (NH_4)_2B_4O_7.4H_2O$ + $Na_2B_4O_7.10H_2O$ | 173.6 | 13.50 | | | | | | | | | | | | | | | | | | | | | | |
| C | $Na_2SO_4.10H_2O$ | 166.9 | 13.50 | 2.60 | | | | | | | | | | 12.68 | 7.31 | 1.98 | | 23.34 | 10.41 | 2.91 | | 33.46 | 12.89 | 3.85 | |
| H | $(NH_4)_2B_4O_7.4H_2O$ | | | | | | | | | | | | | | | | | | | | | | | | |
| A | $Na_2B_4O_7.10H_2O$ | | | | | | | | | | | | | | | | | | | | | | | | |
| D | $Na_2SO_4.10H_2O$ + $(NH_4)_2SO_4.Na_2SO_4.4H_2O$ | | | | | 153.00 | 19.72 | | | 127.0 | 30.50 | | | | | | | 103.6 | 49.0 | | | 90.80 | 58.00 | | | 60.4 | 103.60 | | |
| E | $(NH_4)_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | | | | | 178.40 | 16.06 | | | 182.0 | 19.80 | | | | | | | 186.0 | 25.0 | | | 189.80 | 27.50 | | | 193.60 | 37.0 | | |
| G | $(NH_4)_2SO_4 + (NH_4)_2B_4O_7.4H_2O$ | 180.8 | | 3.60 | | 184.0 | | 4.90 | | 189.0 | | 5.0 | | | | | | 195.45 | | 5.26 | | 198.40 | | 6.50 | | 204.23 | | 9.56 | |
| I | $Na_2B_4O_7.10H_2O$ + $(NH_4)_2B_4O_7.4H_2O$ | | | | | | | | | | | | 6.59 | 12.67 | 1.66 | | | | 9.80 | 2.35 | | | 12.80 | 3.22 | | | | 19.88 | 6.25 |
| B | $Na_2SO_4.10H_2O + Na_2B_4O_7.10H_2O$ | | | | | | | | | | | | | | 1.80 | | | 23.32 | | 1.38 | | 32.22 | | 2.33 | | 72.27 | | 2.63 |
| R | $(NH_4)_2SO_4.Na_2SO_4.4H_2O$ + $Na_2SO_4.10H_2O + Na_2B_4O_7\ 10H_2O$ | 158.95 | 15.55 | | 2.95 | 156.12 | 14.83 | | 3.26 | 129.73 | 26.30 | | | | 4.70 | 106.39 | 42.54 | | 5.25 | 93.0* | 59.0* | | 5.50* | 62.64 | 104.57 | | 5.88 |
| Q | $(NH_4)_2SO_4.Na_2SO_4.4H_2O + (NH_4)_2B_4O_7.4H_2O + Na_2B_4O_7.10H_2O$ | | | | | 157.25 | 14.33 | | 2.80 | 132.13 | 25.0 | | | | 5.0 | 116.49 | 37.15 | | 7.58 | 113.56 | 43.80 | | 9.35 | 114.0 | 53.18 | | 14.98 |
| | $(NH_4)_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O + Na_2B_4O_7.10H_2O$ | 160.4 | 14.60 | | 2.90 | | | | | | | | | | | | | | | | | | | | | |
| P | $(NH_4)_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O + (NH_4)_2B_4O_7.4H_2O$ | | | | | 177.55 | 9.85 | 2.60 | | 182.92 | 18.10 | 4.69 | | 187.65 | 23.78 | 6.05 | | 189.25* | 27.0* | 7.25* | | 193.89 | 34.0 | 10.11 | |

| | Solid phases | $t = 35°C$ | | | | $t = 45°C$ (*v.* Fig. 93) | | | | $t = 55°C$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.5A | 0.5B | 0.5C | 0.5D | 0.5A | 0.5B | 0.5C | 0.5D | 0.5A | 0.5B | 0.5C | 0.5D |
| C | $Na_2SO_4$ | | 125.33 | | | | 120.66 | | | | 117 03 | | |
| | $Na_2SO_4$ | 216.20 | | | | 225.0 | | | | 234.91 | | 58.34 | |
| F | $(NH_4)_2SO_4$ | | | 28.14 | | | | 42.41 | | | | | 25.23 |
| H | $(NH_4)_2B_4O_7.4H_2O$ | | | | 9.06 | | | | 14.47 | | 57.40 | | 19.26 |
| A | $Na_2B_4O_7.10H_2O$ | | | | | | | | | | | 57.29 | 48.79 |
| | $Na_2B_4O_7.10H_2O + Na_2B_4O_7.5H_2O$* | 78.40 | 105.80 | | | 114.0 | 100.0 | | | 169.20 | 91.20 | | |
| D | $Na_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | 201.0 | 46.50 | | | 206.0 | 57.70 | | | 210.0 | 78.0 | | |
| E | $(NH_4)_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | 208.94 | | 14.61 | | 218.0 | | 26.50 | | 228.0 | | 38.0 | |
| G | $(NH_4)_2SO_4 + (NH_4)_2B_4O_7.4H_2O$ | | | | | | | | | | | 74.73 | 52.86 |
| | $(NH_4)_2B_4O_7.4H_2O + Na_2B_4O_7.5H_2O$ | | | | | | | 49.0 | 25.0 | | 108.0 | | 16.26 |
| I | $(NH_4)_2B_4O_7.4H_2O + Na_2B_4O_7.10H_2O$ | | | | | | | | | | | | |
| | $Na_2SO_4 + Na_2B_4O_7.5H_2O$ | | | 31.14 | 12.21 | | 114.57 | | 8.38 | | | | |
| | $(NH_4)_2B_4O_7.4H_2O + Na_2B_4O_7.10H_2O$ | | 123.59 | | 4.27 | | | | | | | | |
| B | $Na_2SO_4 + Na_2B_4O_7.10H_2O$ | 89.82 | 89.85 | | 17.57 | 190.65 | 63.0 | 31.0 | | 170.22 | 98.42 | 60.37 | |
| | $(NH_4)_2SO_4.Na_2SO_4.4H_2O + Na_2SO_4 + Na_2B_4O_7.10H_2O$ | | | | | | | | | 168 61 | 99.26 | 60.53 | |
| P | $(NH_4)_2SO_4.Na_2SO_4.4H_2O + (NH_4)_2SO_4 + (NH_4)_2B_4O_7.4H_2O$ | | | | | | | | | | | | |
| | $(NH_4)_2SO_4.Na_2SO_4.4H_2O + Na_2SO_4 + (NH_4)_2B_4O_7.4H_2O$ | | | | | | | | | | | | |
| | $(NH_4)_2SO_4.Na_2SO_4.4H_2O + (NH_4)_2B_4O_7.4H_2O + Na_2B_4O_7.10H_2O$ | 116.79 | 60.22 | 17.54 | 28.19 | | | | | | | | |
| | $(NH_4)_2SO_4.Na_2SO_4.4H_2O + (NH_4)_2SO_4 + (NH_4)_2B_4O_7.4H_2O$ | 195.59 | 44.41 | | | 165.76 | 76.42 | 33.25 | | 140.63 | 26.78 | | 94.09 |
| Q | $(NH_4)_2SO_4.Na_2SO_4.4H_2O + Na_2SO_4 + (NH_4)_2B_4O_7.4H_2O$ | | | | | 121.44 | 58.89 | | 52.90 | | | | |
| S | $Na_2SO_4 + (NH_4)_2B_4O_7.4H_2O + Na_2B_4O_7.5H_2O$ | | | | | 58.0 | 89.0 | | 32.50 | | | | |
| T | $Na_2SO_4 + Na_2B_4O_7.10H_2O + Na_2B_4O_7.5H_2O$* | | | | | 93 50 | 23 51 | | 66 50 | | | | |
| R | $(NH_4)_2B_4O_7.4H_2O + Na_2B_4O_7.10H_2O + Na_2B_4O_7.5H_2O$* | | | | | | | | | | | | |

* By interpolation. Data for this system at −16.32, −13, −11.02, 25.06, 38.70, 40, 41, 41.7, 50 and 55.7°C, are also given by the authors.

† 0.5A = $0.5(NH_4)_2SO_4$, 0.5B = $0.5Na_2SO_4$, 0.5C = $0.5(NH_4)_2B_4O_7$, 0.5D = $0.5Na_2B_4O_7$.

**$SO_4^{--}$ $NH^+$ $B_4O_7^{--}$ $Na^+$.—(*Continued*)**

Invariant points

| °C | Solid phases | Liquid phase—M per 1000M $H_2O$† | | | |
|---|---|---|---|---|---|
| | | 0.5A | 0.5B | 0.5C | 0.5D |
| −20.15 | $(NH_4)_2SO_4 + Na_2B_4O_7.10H_2O + (NH_4)_2B_4O_7.4H_2O$ + Ice | 172 | 11.50 | | 2.40 |
| −19.60 | $(NH_4)_2SO_4 + Na_2SO_4.10H_2O + Na_2B_4O_7.10H_2O$ + Ice | 159.30 | 16.10 | | 2.80 |
| −19.34 | $(NH_4)_2SO_4 + (NH_4)_2B_4O_7.4H_2O$ + Ice | 179.53 | | 2.44 | |
| −19.50 | $(NH_4)_2SO_4 + Na_2SO_4.10H_2O$ + Ice | 173.2 | 13.40 | | |
| −19.05 | $(NH_4)_2SO_4$ + Ice | 180 | | | |
| −16.32 | $(NH_4)_2SO_4 + Na_2SO_4.10H_2O + (NH_4)_2SO_4.Na_2SO_4.4H_2O + Na_2B_4O_7.10H_2O$ | 158.92 | 15.78 | | 2.93 |
| −16.0 | $(NH_4)_2SO_4 + Na_2SO_4.10H_2O + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | 173.60 | 13.50 | | |
| −11.02 | $(NH_4)_2SO_4.Na_2SO_4.4H_2O + (NH_4)_2SO_4 + (NH_4)_2B_4O_7.4H_2O + Na_2B_4O_7.10H_2O$ | 180.10 | 6.90 | | 2.70 |
| − 1.38 | $Na_2B_4O_7.10H_2O + Na_2SO_4.10H_2O$ + Ice | | 10.16 | | 1.15 |
| − 1.22 | $(NH_4)_2B_4O_7.4H_2O + Na_2B_4O_7.10H_2O$ + Ice | | | 6.81 | 1.19 |
| − 1.20 | $Na_2SO_4.10H_2O$ + Ice | | 10.23 | | |
| − 1.07 | $(NH_4)_2B_4O_7.4H_2O$ + Ice | | | 7.08 | |
| − 0.45 | $Na_2B_4O_7.10H_2O$ + Ice | | | | 1.96 |
| +25.65 | $(NH_4)_2SO_4.Na_2SO_4.4H_2O + Na_2SO_4.10H_2O + Na_2SO_4 + Na_2B_4O_7.10H_2O$ | 62.13 | 108.76 | | 6.9 |
| 26.50 | $Na_2SO_4.10H_2O + Na_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | 57.20 | 114.6 | | |
| 31.9 | $Na_2SO_4.10H_2O + Na_2SO_4 + Na_2B_4O_7.10H_2O$ | | 124.06 | | 3.78 |
| 38.70 | $(NH_4)_2SO_4.Na_2SO_4.4H_2O + Na_2SO_4 + Na_2B_4O_7.10H_2O + (NH_4)_2B_4O_7.4H_2O$ | 118.45 | 63.73 | | |
| 41.70 | $Na_2SO_4 + (NH_4)_2B_4O_7.4H_2O + Na_2B_4O_7.10H_2O + Na_2B_4O_7.5H_2O$ | 111.78 | 69.95 | | 48.43 |
| 49.30 | $Na_2B_4O_7.10H_2O + Na_2B_4O_7.5H_2O + Na_2SO_4$ | | 112.09 | | 12.40 |
| 50.55 | $Na_2B_4O_7.10H_2O + Na_2B_4O_7.5H_2O + (NH_4)_2B_4O_7.4H_2O$ | | | 60.89 | 37.69 |
| 55.70 | $(NH_4)_2SO_4.Na_2SO_4.4H_2O + (NH_4)_2SO_4 + Na_2SO_4 + (NH_4)_2B_4O_7.4H_2O$ | 168.28 | 101.28 | 62.89 | |
| 59.3 | $(NH_4)_2SO_4 + Na_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | 212.0 | 87.0 | | |

† 0.5A = $0.5(NH_4)_2SO_4$, 0.5B = $0.5Na_2SO_4$, 0.5C = $0.5(NH_4)_2B_4O_7$, 0.5D = $0.5Na_2B_4O_7$.

**$SO_4^{--}$ $NH_4^+$ $La^{+++}$**

$H_2O + (NH_4)_2SO_4 + La_2(SO_4)_3$

$t$ = 18°C (22)

g per 100g $H_2O$

| $(NH_4)_2SO_4$ | $La_2(SO_4)_3$.?$H_2O$ |
|---|---|
| 0.0 | 2.130 |
| 4.011 | 0.393 |
| 8.727 | 0.279 |
| 18.241 | 0.253 |
| 36.112 | 0.277 |
| 53.823 | 0.067 |
| 73.782 | 0.0033 |

**$SO_4^{--}$ $NH_4^+$ $Ce^{+++}$**

$H_2O + (NH_4)_2SO_4 + Ce_2(SO_4)_3$

$t$ = 16°C (22)

g per 100g $H_2O$

| $(NH_4)_2SO_4$ | $Ce_2(SO_4)_3$ $Ce_2(SO_4)_3$.?$H_2O$ |
|---|---|
| 0.0 | 10.747 |
| 3.464 | 1.026 |
| 9.323 | 0.782 |
| 19.240 | 0.748 |
| 29.552 | 0.701 |
| 45.616 | 0.497 |
| 55.083 | 0.194 |
| 63.920 | 0.090 |
| 72.838 | 0.035 |

At 25°C, (401.1) shows that solid phases are $Ce_2(SO_4)_3.(NH_4)_2SO_4.8H_2O$ and $Ce_2(SO_4)_3.5(NH_4)_2SO_4$.

**$SO_4^{--}$ $NH_4^+$ $Sa^{+++}$**

$H_2O + (NH_4)_2SO_4 + Sa_2(SO_4)_3$

$t$ = 25°C (229)

g per 100g $H_2O$

| $(NH_4)_2SO_4$ | $Sa_2(SO_4)_3$ $Sa_2(SO_4)_3$.?$H_2O$ |
|---|---|
| 0.3 | 2.10 |
| 0.8 | 2.00 |
| $Sa_2(SO_4)_3 + (NH_4)_2SO_4.Sa_2(SO_4)_3.7H_2O$ | |
| 1.1 | 2.80 |

**$SO_4^{--}$ $NH_4^+$ $Sa^{+++}$.—(*Cont'd*)**

g per 100g $H_2O$

| $(NH_4)_2SO_4$ | $Sa_2(SO_4)_3$ $(NH_4)_2SO_4.Sa_2(SO_4)_3.7H_2O$ |
|---|---|
| 1.9 | 1.5 |
| 2.7 | 1.2 |
| 7.4 | 0.8 |
| 12.2 | 0.8 |
| 32.5 | 0.9 |
| 46.3 | 1.0 |
| $(NH_4)_2SO_4.Sa_2(SO_4)_3.7H_2O + (NH_4)_2SO_4$ | |
| 77.5 | 1.3 |
| $(NH_4)_2SO_4$ | |
| 76.8 | 0.6 |
| 77.3 | 0.3 |

**$SO_4^{--}$ $NH_4^+$ $Mg^{++}$ $K^+$: $H_2O + (NH_4)_2SO_4 + MgSO_4 + K_2SO_4$; $t$ = 30°C (393); *v.* Fig. 96**

| | Solid phases | Liquid phase—g per 100g of dissolved salts | | | |
|---|---|---|---|---|---|
| | | $(NH_4)_2SO_4$ | $MgSO_4$ | $K_2SO_4$ | $H_2O$ |
| A* | $(NH_4)_2SO_4 + (NH_4)_2SO_4.MgSO_4.6H_2O$ | | | | |
| B | Solid soln.[$(NH_4)_2SO_4$ and $K_2SO_4$] + Solid soln. {$(NH_4)_2SO_4.MgSO_4.6H_2O$ / $K_2SO_4.MgSO_4.6H_2O$} | 69.88 | 4.15 | 25.95 | 229.4 |
| C | | 58.59 | 9.08 | 32.34 | 282.0 |
| D | | 41.52 | 17.86 | 40.61 | 323.2 |
| E | | 19.31 | 33.09 | 47.60 | 328.8 |
| F | $K_2SO_4 + K_2SO_4.MgSO_4.6H_2O$ | 0 | 49.50 | 50.50 | 281 |
| G | $K_2SO_4.MgSO_4.6H_2O + MgSO_4.7H_2O$ | 0 | 70.60 | 29.40 | |
| H* | $(NH_4)_2SO_4 + (NH_4)_2SO_4.MgSO_4.6H_2O$ | | | | |
| I | Solid soln. $(NH_4, K)_2SO_4$ | 9.91 | 40.62 | 49.96 | 350.0 |
| J | | 16.40 | 26.65 | 56.96 | 317.1 |
| K | | 35.67 | 26.68 | 37.64 | 343.9 |
| L | | 37.27 | 21.72 | 41.01 | 338.3 |
| M | Solid soln. $(NH_4, K)_2SO_4.MgSO_4.6H_2O$ | 83.51 | 7.21 | 9.28 | 290.9 |
| N | | 9.56 | 47.39 | 43.08 | 331.6 |
| O | | 24.41 | 56.02 | 19.58 | 352.0 |

* Not realized experimentally: position on diagram indicated roughly.

## $SO_4^{--}$ $NH_4^+$ $Ca^{++}$ [28, 80, 373]: $H_2O + (NH_4)_2SO_4 + CaSO_4$; *v.* Fig. 97

| Solid phases | Liquid phase | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 22.5°C* | | $t$ = 25°C† | | $t$ = 50°C‡ | |
| | % $(NH_4)_2SO_4$ | % $CaSO_4$ | % $(NH)_2SO_4$ | % $CaSO_4$ | % $(NH_4)_2SO_4$ | % $CaSO_4$ |
| $CaSO_4.2H_2O$ | | | | 0.2085 | | |
| | | | 0.0129 | 0.2045 | 1.561 | 0.160 |
| | | | 0.0258 | 0.1997 | 3.033 | 0.173 |
| | | | 0.1033 | 0.1808 | 8.774 | 0.244 |
| | | | 0.2066 | 0.1658 | 14.83 | 0.314 |
| | | | 0.4130 | 0.1539 | 19.95 | 0.366 |
| | | | 0.8237 | 0.1435 | 24.64 | 0.412 |
| | | | 1.6398 | 0.1443 | 29.33 | 0.436 |
| $CaSO_4.2H_2O + CaSO_4.(NH_4)_2SO_4.2H_2O$? | 3.714 | 0.162 | 3.2460 | 0.1589 | 34.75 | 0.447 |
| $CaSO_4.(NH_4)_2SO_4.2H_2O$ | 7.672 | 0.213 | 9.4070 | 0.2211 | 39.34 | 0.289 |
| | 11.450 | 0.254 | 17.966 | 0.3019 | 42.68 | 1.730 |
| | 15.08 | 0.281 | 33.271 | 0.3777 | 45.17 | 1.584 |
| | 18.63 | 0.318 | | | | |
| | 22.10 | 0.332 | | | | |
| | 25.24 | 0.357 | | | | |
| | 28.74 | 0.370 | | | | |
| $(NH_4)_2SO_4$ | | | | | 45.30 | 0 |

| Solid phases | Liquid phase—M per 1000M $H_2O$ [94] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 25°C | | $t$ = 50°C | | $t$ = 60°C | |
| | $(NH_4)_2SO_4$ | $CaSO_4$ | $(NH_4)_2SO_4$ | $CaSO_4$ | $(NH_4)_2SO_4$ | $CaSO_4$ | $(NH_4)_2SO_4$ | $CaSO_4$ |
| $CaSO_4.2H_2O + CaSO_4.(NH_4)_2SO_4.H_2O$§ | 58.7 | | 72.2 | 0.44 | | | | |
| $CaSO_4.(NH_4)_2SO_4.H_2O + 5CaSO_4.(NH_4)_2SO_4.H_2O$ | | | 72.7 | 0.4 | | | | |
| $CaSO_4.2H_2O + CaSO_4.(NH_4)_2SO_4.H_2O$ | | | | | 74.0 | 0.93 | | |
| $CaSO_4.(NH_4)_2SO_4.H_2O + 5CaSO_4.(NH_4)_2SO_4.H_2O$ | | | | | | | 76.10 | 1.12 |

| | $t$ = 83°C | | Invariant points |
|---|---|---|---|
| $CaSO_4.2H_2O + 5CaSO_4.(NH_4)_2SO_4.H_2O$ | 37.5 | 0.45 | $CaSO_4.2H_2O + CaSO_4.(NH_4)_2SO_4.H_2O + 5CaSO_4.$- |
| $5CaSO_4.(NH_4)_2SO_4.H_2O + 2CaSO_4.(NH_4)_2SO_4$ | 63.3 | 0.53 | $(NH_4)_2SO_4.H_2O$ at 17°C. $CaSO_4.(NH_4)_2SO_4.H_2O +$ |
| $2CaSO_4.(NH_4)_2SO_4 + CaSO_4.(NH_4)_2SO_4.H_2O$ | 125.8 | 0.66 | $5CaSO_4.(NH_4)_2SO_4.H_2O + 2CaSO_4.(NH_4)_2SO_4$ at 76°C. |

* Data from Cohn [80] recalculated. Used gypsum but did not examine solid phases after saturation, hence those specified in doubt.

† Data from Sullivan [373]. Used gypsum but did not examine solid phases after saturation, hence those specified in doubt.

‡ Data from Bell and Taber [28]. Used gypsum.

§ Bell and Taber [28, 29] found this salt to be $CaSO_4.(NH_4)_2SO_4.2H_2O$, not as given by D'Ans [94].

## $SO_4^{--}$ $NH_4^+$ $Li^+$ [337]
## $H_2O + (NH_4)_2SO_4 + Li_2SO_4$; *v.* Fig. 98

| | Solid phases | Liquid phase | | | |
|---|---|---|---|---|---|
| | | $t$ = 30°C | | $t$ = 50°C | |
| | | % $(NH_4)_2SO_4$ | % $Li_2SO_4$ | % $(NH_4)_2SO_4$ | % $Li_2SO_4$ |
| A | $Li_2SO_4.H_2O$ | | 25.10 | | 24.30 |
| | | 6.66 | 23.67 | 7.56 | 22.86 |
| | | 9.42 | 23.02 | 9.63 | 22.79 |
| B | $Li_2SO_4.H_2O + NH_4LiSO_4$ | 12.43* | 21.86* | 13.94* | 21.22* |
| C | $NH_4LiSO_4$ | 19.29 | 16.58 | 19.65 | 16.35 |
| | | 28.75 | 10.78 | | |
| | | 35.56 | 7.84 | | |
| D | $NH_4LiSO_4 + (NH_4)_2SO_4$ | 39.47* | 6.51* | 43.05 | 5.86 |
| E | $(NH_4)_2SO_4$ | 40.95 | 2.93 | | |
| | | 44.10 | 0 | 45.70 | |

* Average of two or more results.

$SO_4^{--}$ $NH_4^+$ $Na^+$; *v.* p. 333

## $SO_4^{--}$ $NH_4^+$ $K^+$ [393]
## $H_2O + (NH_4)_2SO_4 + K_2SO_4$; *v.* Fig. 100

| Solid phase | | Liquid phase | |
|---|---|---|---|
| % $(NH_4)_2SO_4$ | % $K_2SO_4$ | % $(NH_4)_2SO_4$ | % $K_2SO_4$ |
| | $t$ = 25°C | | |
| 100 | 0 | 56.48 | 0.0 |
| 86 | 12 | 40.92 | 1.83 |
| 72 | 28 | 38.64 | 3.09 |
| 60 | 40 | 37.00 | 4.00 |
| 47 | 53 | 35.12 | 4.40 |
| 31 | 69 | 31.37 | 5.42 |
| 16 | 84 | 22.28 | 7.35 |
| 6 | 94 | 10.76 | 9.52 |
| 0 | 100 | 0.0 | 10.71 |
| | $t$ = 30°C | | |
| 100 | 0 | 44.20 | 0.0 |
| 96.7 | 3.3 | 42.70 | 1.2 |
| 87.8 | 12.2 | 40.90 | 2.4 |
| 71.3 | 28.7 | 37.80 | 4.10 |
| 56.4 | 43.6 | 33.50 | 5.90 |
| 38.7 | 61.3 | 31.00 | 6.40 |
| 25.8 | 74.2 | 18.50 | 9.10 |
| 1.8 | 98.2 | 8.4 | 10.70 |
| 0.0 | 100.00 | 0.0 | 11.12 |

$SO_4^{--}$ $NH_4^+$ $Na^+$ (101, 124, 142, 279, 311)

$H_2O + (NH_4)_2SO_4 + Na_2SO_4$; *v.* Fig. 99

| Solid phases | Liquid phase | | | | | |
|---|---|---|---|---|---|---|
| | $t = -13°C$ | | $t = -10°C$ | | $t = 0°C$ | |
| | % $(NH_4)_2SO_4$ | % $Na_2SO_4$ | % $(NH_4)_2SO_4$ | % $Na_2SO_4$ | % $(NH_4)_2SO_4$ | % $Na_2SO_4$ |
| $(NH_4)_2SO_4 + Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | 38.04 | 3.35 | 38.15 | 3.68 | 38.22 | 4.47 |
| $(NH_4)_2SO_4.Na_2SO_4.4H_2O + Na_2SO_4.10H_2O$ | 35.49 | 3.95 | 34.23 | 4.74 | 29.37 | 7.59 |

| | $t = 15°C$ | | $t = 25°C$ | | $t = 30°C$ | | $t = 35°C$ | | $t = 60°C$ | |
|---|---|---|---|---|---|---|---|---|---|---|
| | % A* | % B* | % A* | % B* | % A* | % B* | % A* | % B* | % A* | % B* |
| $(NH_4)_2SO_4$ | 42.36 | | 43.40 | | 43.79 | | 44.67 | | 46.80 | |
| | 41.19 | 2.23 | 39.16 | 6.65 | 41.30 | 4.09 | 42.17 | 3.77 | 40.30 | 10.70 |
| | 39.73 | 4.35 | | | 39.87 | 6.00 | 40.37 | 7.23 | | |
| $(NH_4)_2SO_4 + Na_2SO_4$ | | | | | | | | | 36.91 | 16.33 |
| $(NH_4)_2SO_4 + Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | 38.19 | 7.03 | 38.70 | 7.95 | 38.45 | 8.46 | 37.84 | 10.41 | | |
| $Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | 36.30 | 7.85 | 27.42 | 14.12 | 37.20 | 9.08 | 31.21 | 13.14 | | |
| | 31.96 | 9.62 | 15.80 | 23.90 | 34.58 | 10.27 | 27.61 | 15.43 | | |
| | 29.24 | 11.06 | | | 31.77 | 11.57 | 25.84 | 16.59 | | |
| | 25.26 | 13.16 | | | 28.77 | 13.46 | 24.54 | 17.62 | | |
| | 23.10 | 14.30 | | | 25.34 | 15.85 | 20.45 | 21.24 | | |
| | | | | | 22.07 | 18.34 | 18.76 | 22.87 | | |
| | | | | | 18.60 | 21.49 | | | | |
| | | | | | 14.93 | 25.59 | | | | |
| $Na_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | | | | | 14.49 | 25.98 | 17.18 | 24.53 | | |
| $Na_2SO_4$ | | | | | 13.45 | 26.57 | 11.90 | 27.41 | | |
| | | | | | 9.89 | 28.33 | 4.47 | 30.83 | | |
| | | | | | 7.85 | 29.49 | | 33.12 | 29.48 | 18.70 |
| | | | | | | | | | 9.70 | 26.94 |
| | | | | | | | | | | 31.20 |
| $Na_2SO_4 + Na_2SO_4.10H_2O$ | | | | | 6.35 | 30.64 | | | | |
| $Na_2SO_4.10H_2O + Na_2SO_4.(NH_4)_2SO_4.4H_2O$ | 20.61 | 16.53 | 14.10 | 25.76 | | | | | | |
| $Na_2SO_4.10H_2O$ | 20.12 | 14.96 | 12.50 | 24.50 | 3.61 | 29.91 | | | | |
| | 9.21 | 13.87 | 7.40 | 21.78 | | 29.11 | | | | |
| | | 11.71 | | 21.71 | | | | | | |

| | $t = 40°C$ | | $t = 50°C$ | | $t = 55°C$ | | $t = 75°C$ | | $t = 100°C$ | |
|---|---|---|---|---|---|---|---|---|---|---|
| | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B |
| $(NH_4)_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | 38.50 | 10.11 | 37.69 | 12.77 | | | | | | |
| $Na_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | 19.80 | 23.11 | 26.90 | 19.82 | 31.31 | 18.18 | | | | |
| | $t = 80°C$ | | | | | | | | | |
| $(NH_4)_2SO_4 + Na_2SO_4$ | 38.90 | 16.00 | | | | | 38.24 | 16.38 | 40.79 | 16.27 |

* A = $(NH_4)_2SO_4$; B = $Na_2SO_4$.

Invariant points

| Solid phases | Liquid phase | | |
|---|---|---|---|
| | °C | % $(NH_4)_2SO_4$ | % $Na_2SO_4$ |
| $Na_2SO_4.10H_2O + (NH_4)_2SO_4 + Ice$ | −19.5 | 63.5 | 5.29 |
| $Na_2SO_4.10H_2O + (NH_4)_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | −16 | 63.6 | 5.32 |
| $Na_2SO_4.10H_2O + Na_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | +26.5 | 12.64 | 27.20 |
| $Na_2SO_4 + (NH_4)_2SO_4 + (NH_4)_2SO_4.Na_2SO_4.4H_2O$ | 59.3 | 36.65 | 16.18 |

Data for 15 and 35°C from (124), recalculated from g per l; for 30°C from (279); for 25 and 60°C from (142); for remaining temperatures from (101), recalculated from g per 100g $H_2O$. Fedotiev and Kolossov (124) assign to the double salt the formula $Na(NH_4)SO_4.3H_2O$.

$SO_4^{--}$ $PO_4^{---}$ $Ca^{++}$: $H_2O + H_2SO_4 + Ca_3(PO_4)_2$

$t = 25°C$ (374)

| % $H_3PO_4$ | % $CaSO_4$ | % $H_3PO_4$ | % $CaSO_4$ |
|---|---|---|---|
| | $CaSO_4.2H_2O$* | | |
| 0.0 | 0.2126 | 18.103 | 0.7166 |
| 0.689 | 0.3132 | 24.695 | 0.7321 |
| 1.439 | 0.3708 | 35.263 | 0.6523 |
| 2.908 | 0.4386 | 44.395 | 0.5567 |
| 6.175 | 0.5565 | 50.790 | 0.4145 |
| 13.517 | 0.6807 | | |

* In these determinations gypsum was added to a mixture of $H_2O$ and $H_3PO_4$. The resulting solutions contained equivalent amounts of CaO and $SO_4$, indicating that no calcium phosphate had separated. The author does not note any change in the hydration of the calcium sulfate.

$SO_4^{--}$ $PO_4^{---}$ $Ca^{++}$ $K^+$

$H_2O + H_2SO_4 + Ca_3(PO_4)_2 + K_2SO_4$; $t = 25°C$ (94)

M per 1000M $H_2O$

| $H_3PO_4$ | $K_2SO_4$ | * | $CaSO_4$ |
|---|---|---|---|
| | | $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O$ | |
| 6.60 | | 4.33 | |
| 14.00 | | 5.26 | |
| 44.60 | 6.65 | | 0.222 |
| 109.20 | | 9.77 | |

* $K_2SO_4 + CaSO_4$ (separate determination not made).

$SO_4^{--}$ $CO_3^{--}$ $Mg^{++}$ $Na^+$;
$SO_4^{--}$ $CO_3^{--}$ $Ca^{++}$ $Na^+$;
$SO_4^{--}$ $CO_3^{--}$ $Ca^{++}$ $K^+$;
*v.* p. 334

$SO_4^{---}$ $CO_3^{--}$ $Sr^{++}$ $Na^+$

$H_2O + SrSO_4 + Na_2CO_3$

$t = 25°C$ (177)

| $M_{Na_2CO_3}$/l | $M_{Na_2SO_4}$/l | |
|---|---|---|
| | | $SrSO_4 + SrCO_3$ |
| 0.0765 | 1.1285 | |
| 0.038 | 0.5645 | |
| 0.0191 | 0.02821 | |

$SO_4^{--}$ $CO_3^{--}$ $Mg^{++}$ $Na^+$ (69)
$H_2O + MgCO_3 + Na_2SO_4$
$t$ = 24°C

| g $Na_2SO_4$/l | g $MgCO_3$/l $MgCO_3$(?) |
|---|---|
| 0.0 | 0.216 |
| 25.12 | 0.586 |
| 54.76 | 0.828 |
| 95.68 | 1.020 |
| 160.80 | 1.230 |
| 191.90 | 1.280 |
| 254.60 | 1.338 |
| 278.50 | 1.338 |
| 305.10 | 1.338 |

$t$ = 35.5°C

| | $MgCO_3$(?) |
|---|---|
| 0.32 | 0.131 |
| 41.84 | 0.577 |
| 81.84 | 0.753 |
| 116.56 | 0.904 |
| 148.56 | 0.962 |
| 186.70 | 1.047 |
| 224.0 | 1.088 |
| 247.00 | 1.100 |
| 299.0 | 1.130 |

$SO_4^{--}$ $CO_3^{--}$ $Ca^{++}$ $Na^+$
$H_2O + CaCO_3 + Na_2SO_4$
$t$ = 25°C (59)

| % $Na_2SO_4$ | % $CaCO_3$ $CaCO_3$ |
|---|---|
| 0.960 | 0.0149 |
| 1.623 | 0.0177 |
| 4.670 | 0.0249 |
| 11.258 | 0.0277 |
| 12.705 | 0.0281 |
| 16.229 | 0.0289 |
| 17.364 | 0.0283 |
| 19.284 | 0.0290 |

$SO_4^{--}$ $CO_3^{--}$ $Ca^{++}$ $K^+$
$H_2O + CaCO_3 + K_2SO_4$
$t$ = 25°C (64)

| % $K_2SO_4$ | % $CaCO_3$ $CaCO_3$ |
|---|---|
| 1.60 | 0.0104 |
| | $CaSO_4.K_2SO_4.H_2O$ |
| 3.15 | 0.0116 |
| 4.73 | 0.0132 |
| 6.06 | 0.0148 |
| 7.85 | 0.0168 |
| 8.88 | 0.0192 |
| 10.18 | 0.0192 |
| 10.48 | 0.0188 |

$SO_4^{--}$ $CO_3^{--}$ $Ba^{++}$ $K^+$ (268)
$H_2O + BaCO_3 + K_2SO_4$; *v.* Fig. 101

| | Solid phases | Liquid phase—M per 100M $H_2O$, $t$ = 25°C: 0.5$K_2CO_3$ | 0.5$K_2SO_4$ |
|---|---|---|---|
| A | $K_2CO_3.2H_2O + BaCO_3$ | 295.8 | |
| B | $K_2CO_3.2H_2O + BaCO_3 + K_2SO_4$ | 295.60 | 0.102 |
| C | $K_2SO_4 + BaCO_3$ | 105.20 | 2.60 |
| D | | 75.60 | 4.66 |
| E | $BaCO_3 + K_2SO_4 + BaSO_4$ | 58.20 | 6.44 |
| F | $K_2SO_4 + BaSO_4$ | 39.40 | 9.70 |
| G | | 17.44 | 15.60 |
| H | | 0 | 24.94 |
| I | $BaCO_3 + BaSO_4$ | 20.80 | 1.352 |
| J | | 7.66 | 0.368 |
| | $t$ = 80°C | | |
| | $BaCO_3 + K_2SO_4 + BaSO_4$ | 51.40 | 18.92 |
| | $BaCO_3 + BaSO_4$ | 13.58 | 3.06 |
| | | 6.70 | 1.308 |
| | $t$ = 100°C | | |
| | $BaCO_3 + K_2SO_4 + BaSO_4$ | 46.0 | 25.30 |
| | $BaCO_3 + BaSO_4$ | 12.56 | 4.04 |
| | | 6.34 | 1.702 |

$SO_4^{--}$ $CO_3^{--}$ $Na^+$ (72)
$H_2O + Na_2SO_4 + Na_2CO_3$; *v.* Fig. 102

| °C | Solid phases | Liquid phase % $Na_2CO_3$ | % $Na_2SO_4$ |
|---|---|---|---|
| 15 | $Na_2SO_4.10H_2O$ | | 11.8 |
| | Solid soln. I* + Solid soln. II† | 12.3 | 8.0 |
| | $Na_2CO_3.10H_2O$ | 14.1 | |
| 20 | $Na_2SO_4.10H_2O$ | | 16.25 |
| | Solid soln. I* + Solid soln. II† | 14.95 | 1.2 |
| | $Na_2CO_3.10H_2O$ | 17.75 | |
| 25 | $Na_2SO_4.10H_2O$ | 0 | 21.9 |
| | Solid soln. I* + Solid soln. II† | 17.9 | 16.2 |
| | $Na_2CO_3.10H_2O$ | 22.6 | |
| 30 | $Na_2SO_4.10H_2O$ | | 29.3 |
| | $Na_2SO_4.10H_2O + Na_2SO_4$ | 10.2 | 25.1 |
| | $Na_2SO_4 + 2Na_2SO_4.Na_2CO_3$ | 15.5 | 19.5 |
| | $2Na_2SO_4.Na_2CO_3 + Na_2CO_3.10H_2O$ | 25.8 | 8.6 |
| | $Na_2CO_3.10H_2O$ | 27.15 | 0 |
| 35 | $Na_2SO_4$ | 0 | 33.15 |
| | $Na_2SO_4 + 2Na_2SO_4.Na_2CO_3$ | 14.3 | 20.6 |
| | $2Na_2SO_4.Na_2CO_3 + Na_2CO_3.7H_2O$ | 30.0 | 5.7 |
| | $Na_2CO_3.7H_2O$ | 33.0 | 0 |
| 50 | $Na_2SO_4$ | 0 | 31.8 |
| | $Na_2SO_4 + 2Na_2SO_4.Na_2CO_3$ | 29.7 | 5.5 |
| | $Na_2CO_3.H_2O$ | 32.2 | |
| 75 | $Na_2SO_4$ | | 30.4 |
| | $Na_2SO_4 + 2Na_2SO_4.Na_2CO_3$ | 7.6 | 24.2 |
| | $2Na_2SO_4.Na_2CO_3 + Na_2CO_3.H_2O$ | 29.0 | 4.8 |
| | $Na_2CO_3.H_2O$ | 31.45 | |

$SO_4^{--}$ $CO_3^{--}$ $Na^+$.—(*Continued*)

* Solid soln. I = $Na_2SO_4.10H_2O$ with from 0 to 7.3 M % $Na_2CO_3.10H_2O$.
† Solid soln. II = $Na_2SO_4.10H_2O$ with from 95 to 100 M % $Na_2CO_3.10H_2O$.

Invariant points; *v.* Fig. 102

| | | Solid phases | Liquid phase % $Na_2CO_3$ | % $Na_2SO_4$ |
|---|---|---|---|---|
| − 1.2 | A | $Na_2SO_4.10H_2O$ + Ice | | 3.85 |
| − 2.1 | G | $Na_2CO_3.10H_2O$ + Ice | 5.75 | |
| − 2.45 | P | $Na_2CO_3.10H_2O + Na_2SO_4.10H_2O$ + Ice | 5.21 | 2.06 |
| +26.1 | Q | $Na_2CO_3.10H_2O + Na_2SO_4.10H_2O + 2Na_2SO_4.Na_2CO_3$ | 19.0 | 17.6 |
| 27.3 | R | $Na_2SO_4.10H_2O + Na_2SO_4 + 2Na_2SO_4.Na_2CO_3$ | 16.3 | 19.3 |
| 30.5 | S | $Na_2CO_3.10H_2O + Na_2CO_3.7H_2O + 2Na_2SO_4.Na_2CO_3$ | 26.2 | 8.3 |
| 35.7 | T | $Na_2CO_3.7H_2O + Na_2CO_3.H_2O + 2Na_2SO_4.Na_2CO_3$ | 30.1 | 5.65 |
| 32.0 | F | $Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$ | | 31.34 |
| 35.37 | E | $Na_2CO_3.7H_2O + Na_2CO_3.H_2O$ | | 33.18 |

Boiling points of saturated solutions

| | | Solid phases | Liquid phase % $Na_2CO_3$ | % $Na_2SO_4$ |
|---|---|---|---|---|
| 102.9 | C | $Na_2SO_4$ | | 29.6 |
| 104.6 | D | $Na_2CO_3.H_2O$ | 31.2 | |
| 103.0 | U | $Na_2SO_4 + 2Na_2SO_4.Na_2CO_3$ | 4.7 | 25.2 |
| 104.8 | V | $Na_2CO_3.H_2O + 2Na_2SO_4.Na_2CO_3$ | 28.1 | 4.5 |

| $t$ = 19.1°C (100) | | $t$ = 50°C (100) | |
|---|---|---|---|
| % $Na_2CO_3$ | % $Na_2SO_4$ | % $Na_2CO_3$ | % $Na_2SO_4$ |
| Solid soln. A* ($Na_2CO_3.10H_2O + Na_2SO_4.10H_2O$) | | Solid soln. B | |
| 15.97 | 4.97 | 25.71 | 7.52 |
| 14.92 | 9.05 | 19.37 | 12.92 |
| 14.82 | 9.50 | 12.55 | 20.38 |
| Solid soln. B† ($Na_2SO_4.10H_2O + Na_2CO_3.10H_2O$) | | 10.52 | 22.47 |
| 14.53 | 10.47 | Solid soln. C | |
| 13.84 | 10.69 | 10.21 | 23.10 |
| 12.13 | 11.06 | 5.06 | 27.31 |
| 9.22 | 11.89 | $t$ = 25°C (37) | |
| 4.85 | 13.17 | $Na_2CO_3.10H_2O$ | |
| $t$ = 50°C (100) | | 22.94 | |
| Solid soln. A | | $Na_2CO_3.10H_2O + Na_2SO_4.10H_2O$ | |
| 28.66 | 5.35 | 18.11 | 15.89 |
| 28.52 | 5.87 | $Na_2SO_4.10H_2O$ | |
| | | 0.0 | 21.84 |

* From 0 to 1.9 Wt. % $Na_2SO_4$.
† From 0 to 2 Wt. % $Na_2CO_3$.

$SO_4^{--}$ $CO_3^{--}$ $Na^+$ $K^+$
$H_2O + Na_2SO_4 + K_2CO_3$; *v.* Fig. 103
$t$ = 25°C (37)

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | |
|---|---|---|---|---|---|
| | | $0.5Na_2CO_3$ | $0.5K_2CO_3$ | $0.5Na_2SO_4$ | $0.5K_2SO_4$ |
| A | $Na_2CO_3.10H_2O$ | 101.26 | | | |
| B | $Na_2CO_3.10H_2O + Na_2SO_4.10H_2O$ | 93.20 | | 61.0 | |
| C | $Na_2SO_4.10H_2O$ | | | 70.82 | |
| D | $Na_2SO_4.10H_2O + K_3Na(SO_4)_2$ | | | 78.54 | 18.72 |
| E | $K_3Na(SO_4)_2 + K_2SO_4$ | | | 17.40 | 27.44 |
| F | $K_2SO_4$ | | | | 24.92 |
| G | $K_2CO_3.\frac{3}{2}H_2O$ | | 295.86 | | |
| H | $K_2CO_3.\frac{3}{2}H_2O + NaKCO_3.6H_2O$ | 37.00 | 171.4 | | |
| I | $NaKCO_3.6H_2O + Na_2CO_3.7H_2O$ | 120.80 | 79.40 | | |
| J | $Na_2CO_3.7H_2O + Na_2CO_3.10H_2O$ | 121.00 | 49.40 | | |
| P | $K_2CO_3.\frac{3}{2}H_2O + NaKCO_3.6H_2O + K_2SO_4$ | 36.80 | 270.20 | | 2.80 |
| Q | $NaKCO_3.6H_2O + Na_2CO_3.7H_2O + K_2SO_4$ | 120.08 | 70.52 | 2.56 | |
| R | $Na_2CO_3.7H_2O + Na_2CO_3.10H_2O + K_2SO_4$ | 121.00 | 48.20 | | 3.00 |
| S | $Na_2CO_3.10H_2O + K_2SO_4 + K_3Na(SO_4)_2$ | 114.60 | 19.20 | | 13.0 |
| T | $K_3Na(SO_4)_2 + Na_2CO_3.10H_2O + Na_2SO_4.10H_2O$ | 88.60 | 7.38 | 64.56 | |

$SO_4^{--}$ $C_2O_4^{--}$ $Th^{++++}$
$H_2O + H_2SO_4 + Th(C_2O_4)_2$
$t$ = 25°C (395)

| M $\frac{1}{2}H_2SO_4$/l | % $Th(C_2O_4)_2$ |
|---|---|
| | $Th(C_2O_4)_2.6H_2O$ |
| 1 | 0.0398 |
| 2 | 0.0602 |
| 2.9 | 0.0695 |
| 4.32 | 0.170 |
| 6.175 | 0.2337 |
| 6.685 | 0.2771 |
| 8.45 | 0.382 |
| $t$ = 25°C (168) | |
| | $Th(C_2O_4)_2.6H_2O$ |
| 0.25 | 0.0108 |
| 0.50 | 0.0216 |
| 1.0 | 0.0412 |
| 2.1 | 0.0646 |
| 3.2 | 0.1097 |
| 4.9 | 0.2034 |

$SO_4^{--}$ $C_2O_4^{--}$ $Sc^{+++}$
$H_2O + H_2SO_4 + Sc_2(C_2O_4)_3$
$t$ = ? (398)

| M $\frac{1}{2}H_2SO_4$/l | % $Sc_2(C_2O_4)_3$ |
|---|---|
| | $Sc_2(C_2O_4)_3.5H_2O$ |
| 1 | 0.1148 |
| 2.1 | 0.2573 |
| 2.43 | 0.2904 |
| 3.57 | 0.4202 |
| 4.32 | 0.5192 |
| 4.86 | 0.5834 |

| M $\frac{1}{2}$ $H_2SO_4$/l | % $Sc_2(C_2O_4)_3$ | |
|---|---|---|
| | $t$ = 25°C | $t$ = 50°C |
| | $Sc_2(C_2O_4)_3.5H_2O$ (265) | |
| 0.1 | 0.0385 | 0.0562 |
| 0.5 | 0.0997 | 0.1481 |
| 1.0 | 0.1663 | 0.2493 |
| 2.0 | 0.3176 | 0.4429 |
| 3.0 | 0.7761 | 1.1280 |

$SO_4^{--}$ $C_2O_4^{--}$ $Y^{+++}$
$H_2O + H_2SO_4 + Y_2(C_2O_4)_3$
$t$ = 25°C (395)

| M $\frac{1}{2}H_2SO_4$/l | % $Y_2(C_2O_4)_3$ |
|---|---|
| | $Y_2(C_2O_4)_3.9H_2O$ |
| 2.16 | 0.6884 |
| 4.32 | 1.40 |

$SO_4^{--}$ $C_2O_4^{--}$ $La^{+++}$
$H_2O + H_2SO_4 + La_2(C_2O_4)_3$
$t$ = 25°C (394)

| % $C_2O_4$ | % $SO_3$ | % $La_2O_3$ |
|---|---|---|
| | | $La_2(C_2O_4)_3.7H_2O$ |
| 0.32 | 7.21 | 0.47 |
| 0.373 | 8.81 | 0.548 |
| 0.497 | 10.79 | 0.73 |
| 0.545 | 14.52 | 0.823 |
| | | $La_2(C_2O_4)_3.7H_2O + (COOH)_2.2H_2O$ |
| 6.004 | 5.14 | 0.002 |
| 3.202 | 14.30 | 0.077 |
| 2.370 | 19.07 | 0.298 |
| | | $La_2(SO_4)_3.9H_2O + (COOH)_2.2H_2O$ |
| 2.20 | 20.0 | 0.345 |
| 2.14 | 21.89 | 0.27 |
| 1.85 | 25.23 | 0.24 |
| | | $La_2(C_2O_4)_3.7H_2O + La_2(SO_4)_3.9H_2O$ |
| 0.84 | 16.43 | 0.749 |
| 0.90 | 16.50 | 0.73 |
| 1.44 | 17.98 | 0.58 |
| | | $La_2(C_2O_4)_3.7H_2O + La_2(SO_4)_3.9H_2O + (COOH)_2.2H_2O$ |
| 2.23 | 19.82 | 0.36 |

$t$ = 25°C (395)

| M $\frac{1}{2}H_2SO_4$/l | % $La_2(C_2O_4)_3$ |
|---|---|
| | $La_2(C_2O_4)_3.7H_2O$ |
| 1.0 | 0.3962 |
| 1.5 | 0.5304 |
| 2.0 | 0.7344 |
| 3.09 | 1.1306 |
| 4.32 | 1.463 |
| 5.30 | 1.746 |
| 5.60 | 1.8155 |

$SO_4^{--}$ $C_2O_4^{--}$ $Ce^{+++}$
$H_2O + H_2SO_4 + Ce_2(C_2O_4)_3$
$t$ = 25°C (395)

| M $\frac{1}{2}H_2SO_4$/l | % $Ce_2(C_2O_4)_3$ |
|---|---|
| | $Ce_2(C_2O_4)_3.9H_2O$ |
| 1 | 0.1802 |
| 1.445 | 0.2788 |
| 2.900 | 0.7467 |
| 3.90 | 0.9957 |
| 4.32 | 1.186 |
| 5.30 | 1.425 |

$SO_4^{--}$ $C_2O_4^{--}$ $Sm^{+++}$
$H_2O + H_2SO_4 + Sm_2(C_2O_4)_3$
$t$ = 25°C (395)

| M $\frac{1}{2}H_2SO_4$/l | % $Sm_2(C_2O_4)_3$ |
|---|---|
| | $Sm_2(C_2O_4)_3.10H_2O$ |
| 1 | 0.1015 |
| 1.445 | 0.1804 |
| 1.93 | 0.2254 |
| 2.80 | 0.3886 |
| 4.32 | 0.7008 |
| 6.175 | 1.072 |

$SO_4^{--}$ $C_2O_4^{--}$ $Gd^{+++}$
$H_2O + H_2SO_4 + Gd_2(C_2O_4)_3$
$t$ = 25°C (395)

| M $\frac{1}{2}H_2SO_4$/l | % $Gd_2(C_2O_4)_3$ |
|---|---|
| | $Gd_2(C_2O_4)_3.10H_2O$ |
| 2.16 | 0.3005 |
| 3.11 | 0.4803 |
| 4.32 | 0.6956 |
| 6.175 | 1.128 |

$SO_4^{--}$ $C_2O_4^{--}$ $Er^{+++}$
$H_2O + H_2SO_4 + Er_2(C_2O_4)_3$
$t$ = 25°C (395)

| M $\frac{1}{2}H_2SO_4$/l | % $Er_2(C_2O_4)_3$ |
|---|---|
| | $Er_2(C_2O_4)_3.14H_2O$ |
| 2.16 | 0.5144 |
| 3.11 | 0.7708 |
| 4.32 | 1.10 |
| 6.175 | 1.72 |

$SO_4^{--}$ $C_2O_4^{--}$ $Na^+$ (82)
$H_2O + Na_2SO_4 + Na_2C_2O_4$

| °C | % $Na_2SO_4$ | % $Na_2C_2O_4$ |
|---|---|---|
| | | $Na_2SO_4.10H_2O + Na_2C_2O_4$ |
| 15 | 10.26 | 0.86 |
| | | $Na_2SO_4 + Na_2C_2O_4$ |
| 50 | 31.95 | 0.22 |

$SO_4^{--}$ $C_2O_4^{--}$ $K^+$ (82)
$H_2O + K_2SO_4 + K_2C_2O_4$

| °C | % $K_2SO_4$ | % $K_2C_2O_4$ |
|---|---|---|
| | | $K_2SO_4 + K_2C_2O_4.H_2O$ |
| 15 | 1.82 | 23.55 |
| 50 | 1.99 | 31.06 |

$SO_4^{--}$ $HCO_3^-$ $Na^+$
$H_2O + Na_2SO_4 + NaHCO_3$
$t$ = 15°C (279)

| % $NaHCO_3$ | % $Na_2SO_4$ |
|---|---|
| | $NaHCO_3$ |
| 7.96 | 0.0 |
| 7.22 | 1.94 |
| 6.74 | 3.29 |
| 6.45 | 4.30 |
| 6.17 | 5.34 |
| 6.03 | 5.76 |
| 5.80 | 6.54 |
| | $NaHCO_3 + Na_2SO_4.10H_2O$ |
| 5.08 | 9.55 |
| | $Na_2SO_4.10H_2O$ |
| 0.0 | 11.59 |

$t$ = 35°C (124)

| % $NaHCO_3$* | % $Na_2SO_4$* |
|---|---|
| | $NaHCO_3$ |
| 10.44 | 0 |
| 7.60 | 6.13 |
| 4.61 | 14.12 |
| 3.33 | 25.61 |
| | $NaHCO_3 + Na_2SO_4$ |
| 2.43 | 30.88 |

* Under pressure of 3 atmospheres of $CO_2$.

**$SO_4^{--}$ $C_2H_3O_2^-$ $Pb^{++}$ $Na^+$**
$H_2O + PbSO_4 + NaC_2H_3O_2$
$t = 25°C$ (140)

| % $NaC_2H_3O_2$ | % $Pb(C_2H_3O_2)_2$ | % $Na_2SO_4$ $PbSO_4$ |
|---|---|---|
| 6.69 | 0.78 | 0.34 |
| 11.76 | 2.73 | 1.26 |
| 16.90 | 5.70 | 2.49 |
| 19.92 | 8.24 | 3.60 |
| 21.51 | 10.75 | 4.68 |
| 69.5 | 0.81 | 0.35 |

**$SO_4^{--}$ $C_2H_3O_2^-$ $Pb^{++}$ $K^+$**
$H_2O + PbSO_4 + KC_2H_3O_2$
$t = 25°C$ (140)

| % $KC_2H_3O_2$ | % $Pb(C_2H_3O_2)_2$ $PbSO_4 + K_2Pb(SO_4)_2$ |
|---|---|
| 4.33 | 2.54 |
| 9.03 | 3.55 |
| 17.81 | 5.43 |
| 22.07 | 5.95 |
| 26.58 | 9.83 |
| 28.82 | 11.40 |
| 28.93 | 19.41 |

**$SO_4^{--}$ $C_2H_3O_2^-$ $Ca^{++}$ $Na^+$ $K^+$**
$H_2O + Ca(C_2H_3O_2)_2 + Na_2SO_4 + K_2SO_4$
$t = 25°C$ (94)
M per 1000M $H_2O$

| $NaC_2H_3O_2$ | $K_2SO_4$ | $CaSO_4$ $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O$ |
|---|---|---|
| 12.91 | 3.513 | 0.529 |
| 30.52 | 3.587 | 0.837 |

**$SO_4^{--}$ $C_2H_3O_2^-$ $Ca^{++}$ $K^+$**
$H_2O + H_2SO_4 + Ca(C_2H_3O_2)_2 + K_2SO_4$
$t = 25°C$ (94)
M per 1000M $H_2O$

| $HC_2H_3O_2$ | $K_2SO_4$ | $CaSO_4$ $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O$ |
|---|---|---|
| 7.57 | 3.01 | 0.220 |
| 41.66 | 3.18 | 0.110 |
| 94.82 | 2.45 | 0.061 |

**$SO_4^{--}$ $C_2H_3O_2^-$ $Ca^{++}$ $K^+$**
$H_2O + HC_2H_3O_2 + CaSO_4 + KC_2H_3O_2$; $t = 25°C$ (94)
M per 1000M $H_2O$

| $K_2SO_4$ | $CaSO_4$ | $HC_2H_3O_2$ | $KC_2H_3O_2$ | $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O$ |
|---|---|---|---|---|
| 2.00 | 0.313 | 3.582 | 0.0 | |
| 0.0 | 0.751 | 15.45 | 1.58 | |

**$SO_4^{--}$ $C_2H_3O_2^-$ $Na^+$**
$H_2O + Na_2SO_4 + NaC_2H_3O_2$
$t = 25°C$ (140)

| % $NaC_2H_3O_2$ | % $Na_2SO_4$ $Na_2SO_4.10H_2O$ |
|---|---|
| 0 | 21.90 |
| 4.10 | 17.72 |
| 7.71 | 16.48 |

**$SO_4^{--}$ $C_2H_3O_2^-$ $Na^+$.—(*Cont'd*)**

| % $NaC_2H_3O_2$ | % $Na_2SO_4$ $Na_2SO_4.10H_2O$ |
|---|---|
| 12.58 | 13.50 |
| 16.26 | 11.50 |
| 20.63 | 8.10 |

**$SO_4^{--}$ $C_2H_3O_2^-$ $K^+$**
$H_2O + K_2SO_4 + KC_2H_3O_2$
$t = 25°C$ (140)

| % $KC_2H_3O_2$ | % $K_2SO_4$ $K_2SO_4$ |
|---|---|
| 6.11 | 6.65 |
| 8.68 | 5.09 |
| 11.29 | 3.99 |
| 15.59 | 2.35 |
| 20.12 | 1.23 |
| 29.95 | 0.39 |

**$SO_4^{--}$ $HC_4H_4O_6^-$ $K^+$**
$H_2O + K_2SO_4 + KHC_4H_4O_6$
$t = 25°C$ (283)

| M½$K_2SO_4$/l | $M_{KHC_4H_4O_6}$/l $KHC_4H_4O_6$ |
|---|---|
| 0 | 0.0347 |
| 0.05 | 0.02083 |
| 0.10 | 0.01471 |
| 0.20 | 0.01003 |

**$SO_4^{--}$ $C_6H_4O_4^{--}$ $Na^+$; $SO_4^{--}$ $\beta$-$C_{10}H_7SO_3^-$ $Na^+$**; *v.* p. 337

**$SO_4^{--}$ $Zr^{++++}$** (166)
$H_2O + H_2SO_4 + Zr(SO_4)_2$
$t = 22°C$

| % $ZrO_2$ | % $SO_3$ $Zr(SO_4)_2.4H_2O$ |
|---|---|
| 0.10 | 56.10 |
| 0.13 | 56.50 |
| 0.21 | 57.20 |
| | $Zr(SO_4)_2.H_2SO_4.3H_2O$ |
| 0.80 | 66.40 |
| 0.65 | 67.50 |
| 0.60 | 68.10 |
| | $t = 39.5°C$ |
| | $Zr(SO_4)_2.4H_2O$ |
| 19.5 | 25.46 |
| 18.8 | 27.00 |
| 17.3 | 25.30 |
| 16.2 | 29.10 |
| 9.6 | 32.30 |
| 5.3 | 34.7 |
| 3.51 | 36.01 |
| 1.03 | 38.20 |
| 0.46 | 39.80 |
| 0.31 | 42.00 |
| 0.14 | 46.80 |
| 0.15 | 56.70 |
| 0.27 | 57.10 |
| 0.60 | 57.80 |
| 2.00 | 59.50 |
| | $Zr(SO_4)_2.H_2SO_4.3H_2O$ |
| 4.55 | 61.50 |
| 3.25 | 62.50 |
| 1.55 | 65.00 |
| 0.96 | 68.40 |
| | $4ZrO_2.3SO_3.14H_2O$ |
| 5.09 | 7.28 |
| 4.66 | 6.83 |

**$SO_4^{--}$ $Zr^{++++}$.—(*Continued*)**

| % $ZrO_2$ | % $SO_3$ $4ZrO_2.3SO_3.14H_2O$ |
|---|---|
| 3.55 | 6.03 |
| 3.06 | 5.54 |
| 2.34 | 4.67 |
| 1.92 | 4.17 |
| 0.99 | 2.61 |
| 0.80 | 2.15 |
| 0.39 | 1.13 |
| 0.33 | 1.01 |
| 0.20 | 0.60 |
| 0.14 | 0.42 |
| 0.29 | 0.0 |

**$SO_4^{--}$ $Th^{++++}$** (235)
$H_2O + H_2SO_4 + Th(SO_4)_2$
$t = 20°C$

| % $H_2SO_4$ | % $Th(SO_4)_2$ $Th(SO_4)_2.8H_2O$ |
|---|---|
| 5.00 | 1.722 |
| 15.00 | 0.9752 |
| 25.00 | 0.3838 |
| 40.00 | 0.0103 |
| | $t = 30°C$ |
| | $Th(SO_4)_2.8H_2O$ |
| | 2.152 |
| 0.466 | 2.055 |
| 0.720 | 2.085 |
| 1.468 | 2.267 |
| 2.983 | 2.311 |
| 4.380 | 2.367 |
| 4.970 | 2.323 |
| 9.950 | 1.961 |
| 15.03 | 1.484 |
| 18.95 | 1.078 |
| 23.64 | 0.7196 |
| 32.68 | 0.3364 |
| | $Th(SO_4)_2.4H_2O$ |
| 37.80 | 0.077 |
| 43.28 | 0.0213 |
| 45.69 | 0.0047 |
| 74.00 | 0.1208 |
| 80.50 | 0.00 |
| | $t$ = "boiling soln." |
| | $Th(SO_4)_2.4H_2O$ |
| 5.00 | 0.7407 |
| 10.00 | 0.4808 |
| 15.00 | 0.3882 |
| | $t = 25°C$ (395) |

| M ½$H_2SO_4$/l | % $Th(SO_4)_2$ $Th(SO_4)_2.9H_2O$ |
|---|---|
| 0.0 | 1.593 |
| 1.1 | 1.831 |
| 2.16 | 1.488 |
| 4.32 | 0.8751 |
| 6.68 | 0.4312 |
| 9.68 | 0.1045 |
| 10.89 | 0.0636 |
| 15.15 | 0.0308 |

**$SO_4^{--}$ $Th^{++++}$ $Li^+$**
$H_2O + Th(SO_4)_2 + Li_2SO_4$
$t = 25°C$ (23)
g per 100g $H_2O$

| $Li_2SO_4$ | $Th(SO_4)_2$ $Th(SO_4)_2.?H_2O$ |
|---|---|
| 0.0 | 1.722 |
| 2.57 | 4.13 |

**$SO_4^{--}$ $Th^{++++}$ $Li^+$.—(*Cont'd*)**
g per 100g $H_2O$

| $Li_2SO_4$ | $Th(SO_4)_2$ $Th(SO_4)_2.?H_2O$ |
|---|---|
| 4.93 | 6.20 |
| 6.98 | 7.95 |
| 9.23 | 9.68 |
| 11.13 | 11.05 |
| 13.18 | 12.54 |
| 16.12 | 14.52 |
| 20.49 | 16.92 |
| 25.18 | 18.87 |

**$SO_4^{--}$ $Th^{++++}$ $Na^+$**
$H_2O + Th(SO_4)_2 + Na_2SO_4$
$t = 16°C$ (21)
g per 100g $H_2O$

| $Na_2SO_4$ | $Th(SO_4)_2$ $Th(SO_4)_2.?H_2O$ |
|---|---|
| 1.094 | 1.743 |
| 1.960 | 2.387 |
| 2.84 | 3.800 |
| 4.11 | 3.375 |
| 9.35 | 1.379 |
| 12.24 | 1.169 |
| 15.36 | 1.048 |

**$SO_4^{--}$ $Th^{++++}$ $K^+$**
$H_2O + Th(SO_4)_2 + K_2SO_4$
$t = 16°C$ (21)
g per 100g $H_2O$

| $K_2SO_4$ | $Th(SO_4)_2$ $Th(SO_4)_2.?H_2O$ |
|---|---|
| 0.0 | 1.390 |
| 0.424 | 1.667 |
| 1.004 | 2.193 |
| 1.224 | 2.514 |
| 1.348 | 1.706 |
| 1.487 | 0.870 |
| 1.844 | 0.370 |
| 3.092 | 0.070 |
| 4.050 | 0.027 |
| 4.825 | 0.003 |

**$SO_4^{--}$ $Tl^+$**; *v. also* p. 337
$t = 25°C$ (95)
M per 1000g soln.

| $H_2SO_4$ | $Tl_2SO_4$ $Tl_2SO_4 + Tl_3H(SO_4)_2$ |
|---|---|
| 2.99 | 0.46 |
| | $Tl_3H(SO_4)_2 + TlHSO_4$ |
| 4.25 | 0.61 |
| | $TlHSO_4$ |
| 4.55 | 0.56 |
| 4.79 | 0.55 |
| 4.89 | 0.59 |
| 4.92 | 0.66 |
| 4.78 | 0.75 |
| 4.26 | 1.01 |
| 4.03 | 1.08 |
| | $t = 25°C$ (280) |

| g $H_2SO_4$/l | g $Tl_2SO_4$/l $Tl_2SO_4$ |
|---|---|
| 0.0 | 54.67 |
| 7.016 | 59.17 |
| 14.02 | 63.06 |

### $SO_4^{--}$ $C_8H_4O_4^{--}$ $Na^+$ (139): $H_2O + Na_2SO_4 + Na_2C_8H_4O_4$

| Solid phases | Liquid phase | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 25°C | | $t$ = 35°C | |
| | % $Na_2P$* | % $Na_2SO_4$ | % $Na_2P$* | % $Na_2SO_4$ | % $Na_2P$* | % $Na_2SO_4$ |
| $2Na_2C_8H_4O_4.7H_2O$ | 40.56 | 0.0 | 43.79 | 0.0 | 46.06 | 0.0 |
| | | | 40.63 | 3.52 | | |
| $2Na_2C_8H_4O_4.7H_2O + Na_2SO_4.10H_2O$ | 40.19† | 0.563† | | | | |
| $2Na_2C_8H_4O_4.7H_2O + Na_2SO_4$ | | | 39.92† | 4.57† | 43.25† | 3.27† |
| $Na_2SO_4.10H_2O$ | 25.83 | 0.63 | 34.06 | 6.39 | | |
| | 0.0 | 4.48 | 27.52 | 7.59 | | |
| | | | 21.09 | 9.67 | | |
| | | | 17.47 | 11.12 | | |
| | | | 12.34 | 13.61 | | |
| | | | 10.14 | 14.78 | | |
| | | | 7.39 | 16.53 | | |
| | | | 6.18 | 17.35 | | |
| $Na_2SO_4.10H_2O + Na_2SO_4$ | | | 35.41† | 6.32† | | |
| $Na_2SO_4$ | | | 37.99 | 5.48 | 28.64 | 9.67 |
| | | | 30.88‡ | 8.69‡ | 11.25 | 22.38 |
| | | | 24.62‡ | 12.62‡ | 0.0 | 33.10 |
| | | | 13.67‡ | 20.91‡ | | |

* P = the phthalate radical ($C_8H_4O_4$). † Average values. ‡ Supersaturated with respect to $Na_2SO_4.10H_2O$.

### $SO_4^{--}$ $\beta$-$C_{10}H_7SO_3^-$ $Na^+$ (85)

$H_2O + Na_2SO_4$ + Sodium $\beta$-naphthalenesulfonate

Solid phase in all cases sodium $\beta$-naphthalenesulfonate

| $t$ = 25°C | | $t$ = 30°C | | $t$ = 40°C | | $t$ = 50°C | | $t$ = 65°C | |
|---|---|---|---|---|---|---|---|---|---|
| % $\beta$ salt | % $Na_2SO_4$ | % $\beta$ salt | % $Na_2SO_4$ | % $\beta$ salt | % $Na_2SO_4$ | % $\beta$ salt | % $Na_2SO_4$ | % $\beta$ salt | % $Na_2SO_4$ |
| 3.42 | 1.97 | 1.97 | 4.81 | 4.3 | 2.85 | 5.72 | 2.87 | 11.75 | 1.68 |
| 2.41 | 3.06 | 0.26 | 13.23 | 2.18 | 5.83 | 3.49 | 5.35 | 7.37 | 5.25 |
| 1.79 | 4.34 | 0.0 | 29.1 | 1.2 | 8.48 | 1.93 | 8.24 | 6.7 | 5.45 |
| 0.93 | 7.4 | | | 0.77 | 10.92 | 1.42 | 10.01 | 1.9 | 12.0 |
| 0.62 | 9.25 | | | 0.0 | 32.5 | 0.0 | 31.9 | 3.14 | 10.86 |
| 0.52 | 10.52 | | | | | | | 0.25 | 26.96 |
| 0.10 | 13.15 | | | | | | | 0.0 | 31.00 |
| 0.0 | 21.90 | | | | | | | | |

### $SO_4^{--}$ $Tl^{+++}$ (266)

$H_2O + H_2SO_4 + Tl_2O_3$; *v.* Fig. 104 and p. 336

| | Solid phases* | Liquid phase | |
|---|---|---|---|
| | | % $H_2SO_4$ in 100 cm³ | g $Tl_2O_3$ dissolved |
| A | $Tl(OH)SO_4.2H_2O$ | 20 | 16.25 |
| B | | 40 | 9.83 |
| C | $TlH(SO_4)_2.4H_2O$ | 50 | 2.52 |
| D | | 70 | 0.30 |

* The authors (266) found transformation of one solid to other extremely slow. The acid salt was found to form in preference to the basic salt at lower temperatures and with larger concentrations of $H_2SO_4$.

**$SO_4^{--}$ $Tl^+$ $Ce^{+++}$**: $H_2O + Tl_2SO_4 + Ce_2(SO_4)_3$; $t$ = 25°C (401.5)

Shows that the solid phases present are $Ce_2(SO_4)_3.Tl_2SO_4.4H_2O$, $Ce_2(SO_4)_3.3Tl_2SO_4.?H_2O$ and $Ce_2(SO_4)_3.4\frac{1}{2}Tl_2SO_4$.

### $SO_4^{--}$ $Tl^+$ $Na^+$: $H_2O + Tl_2SO_4 + Na_2SO_4$; $t$ = 25°C (280)

| g $Tl_2SO_4$/l | g $Na_2SO_4$/l | g $Tl_2SO_4$/l | g $Na_2SO_4$/l |
|---|---|---|---|
| $Tl_2SO_4$ | | | |
| 54.67 | 0.0 | 59.22 | 28.24 |
| 54.52 | 7.06 | | |

### $SO_4^{--}$ $Tl^+$ $Al^{+++}$ $K^+$

$H_2O + Tl_2SO_4 + Al_2(SO_4)_3 + K_2SO_4$

$t$ = 25°C (129)

| Solid phase—M % | | Liquid phase—M per l | |
|---|---|---|---|
| $Al_2(SO_4)_3$.-$Tl_2SO_4.24H_2O$ | $Al_2(SO_4)_3$.-$K_2SO_4.24H_2O$ | $Al_2(SO_4)_3$.-$Tl_2SO_4.24H_2O$ | $Al_2(SO_4)_3$.-$K_2SO_4.24H_2O$ |
| 0.00 | 100.00 | 0.00 | 0.2705 |
| 0.68 | 99.32 | 0.00113 | 0.2882 |
| 3.16 | 96.84 | 0.00407 | 0.2628 |
| 9.16 | 90.84 | 0.01067 | 0.2527 |
| 17.06 | 82.94 | 0.02267 | 0.2514 |
| 31.76 | 68.24 | 0.04356 | 0.2059 |
| 41.77 | 58.23 | 0.05810 | 0.1754 |
| 53.28 | 46.72 | 0.07675 | 0.1472 |
| 55.67 | 44.23 | 0.08410 | 0.1336 |
| 67.93 | 32.07 | 0.1016 | 0.1097 |
| 92.06 | 7.94 | 0.1562 | 0.04236 |
| 100.00 | 0.00 | 0.1783 | 0.00 |

### $SO_4^{--}$ $Zn^{++}$ $Cu^{++}$ (130, 213, 367)

$H_2O + ZnSO_4 + CuSO_4$; *v.* Fig. 105

| Solid phases—Solid soln.* | Solid phase | | | Liquid phase | |
|---|---|---|---|---|---|
| | Composition in M of: | | | | |
| | $CuSO_4$ | $ZnSO_4$ | $H_2O$ | $CuSO_4$ | $ZnSO_4$ |
| | $t$ = 12°C | | | | |
| I† | 0.031 | 0.969 | 7 | 0.102 | 0.898 |
| II† | 0.174 | 0.826 | 7 | | |
| II‡ | 0.386 | 0.614 | 7 | 0.278 | 0.722 |
| III§ | 0.883 | 0.117 | 5 | | |
| | $t$ = 18°C | | | | |
| I | 0.020 | 0.980 | 7 | 0.084 | 0.916 |
| II | 0.149 | 0.851 | 7 | | |
| II | 0.319 | 0.681 | 7 | 0.215 | 0.785 |
| III | 0.828 | 0.172 | 5 | | |
| I | 0.022 | 0.978 | 7 | | |
| II | 0.147 | 0.853 | 7 | | |
| II | 0.400 | 0.600 | 7 | | |
| III | 0.850 | 0.150 | 5 | | |
| | $t$ = 25°C | | | | |
| I | 0.025 | 0.975 | 7 | 0.098 | 0.902 |
| II | 0.135 | 0.865 | 7 | | |
| II | 0.285 | 0.715 | 7 | 0.218 | 0.782 |
| III | 0.793 | 0.207 | 5 | | |

$SO_4^{--}$ $Zn^{++}$ $Cu^{++}$.—(*Continued*)

| Solid phases—Solid soln.* | Solid phase: Composition in M of: $CuSO_4$ | $ZnSO_4$ | $H_2O$ | Liquid phase: $CuSO_4$ | $ZnSO_4$ |
|---|---|---|---|---|---|
| | $t$ = 35°C | | | | |
| I | 0.022 | 0.978 | 7 | 0.081 | 0.919 |
| II | 0.123 | 0.877 | 7 | | |
| II | 0.254 | 0.746 | 7 | 0.180 | 0.820 |
| III | 0.687 | 0.313 | 5 | | |
| | $t$ = 40°C | | | | |
| IV‡ | 0.038 | 0.972 | 6 | 0.111 | 0.889 |
| II | 0.148 | 0.852 | 7 | | |
| II | 0.246 | 0.754 | 7 | 0.158 | 0.842 |
| III | 0.587 | 0.413 | 5 | | |
| | $t$ = 45°C | | | | |
| IV | 0.055 | 0.945 | 6 | 0.147 | 0.853 |
| III | 0.490 | 0.510 | 5 | | |

* Solid solutions are I, II, etc., as indicated. † Rhombic. ‡ Monoclinic. § Triclinic.

$SO_4^{--}$ $Zn^{++}$ $Mn^{++}$ (320)

$H_2O + ZnSO_4 + MnSO_4$; *v.* Fig. 106

| | Solid phases | Solid phases: Composition in M of: $MnSO_4$ | $ZnSO_4$ | $H_2O$ | Liquid phase: $MnSO_4$ | $ZnSO_4$ | $H_2O$ |
|---|---|---|---|---|---|---|---|
| | | $t$ = 0°C | | | | | |
| | $ZnSO_4.7H_2O$ | | 1 | 7 | | 1 | 21.4 |
| A | Solid soln. I | 0.205 | 0.795 | 7 | 0.430 | 0.570 | 17.3 |
| B | Solid soln. II† | 0.32 | 0.68 | 7 | 0.60 | 0.40 | |
| | | 0.52 | 0.48 | 7 | | | |
| | | 0.837 | 0.163 | | 0.866 | 0.134 | |
| | $MnSO_4.7H_2O$ | 1.00 | | 7 | 1.00 | | 15.70 |
| | | $t$ = 20°C | | | | | |
| | $ZnSO_4.7H_2O$ | | 1.00 | 7 | | 1.00 | 16.60 |
| C | Solid. soln. I | 0.191 | 0.809 | 7 | 0.488 | 0.512 | 13.00 |
| D | | 0.235 | 0.765 | 7 | 0.540 | 0.460 | |
| E | Solid soln. II | 0.410 | 0.590 | 7 | | | |
| F | Solid soln. III‡ | 0.665 | 0.335 | 7 | 0.748 | 0.252 | |
| | | 0.865 | 0.135 | 5 | | | |
| | $MnSO_4.5H_2O$ | 1.00 | | 5 | 1.00 | | 13.40 |

$SO_4^{--}$ $Zn^{++}$ $Mn^{++}$.—(*Continued*)

| | Solid phases | Solid phases: Composition in M of: $MnSO_4$ | $ZnSO_4$ | $H_2O$ | Liquid phase: $MnSO_4$ | $ZnSO_4$ | $H_2O$ |
|---|---|---|---|---|---|---|---|
| | | $t$ = 23°C | | | | | |
| | $ZnSO_4.7H_2O$ | | 1.00 | 7 | | 1.00 | 15.90 |
| G | Solid soln. II | 0.59 | 0.41 | 7 | 0.664 | 0.336 | |
| H | | 0.61 | 0.39 | 7 | 0.683 | 0.317 | |
| I | Solid soln. IV* | 0.82 | 0.18 | 4 | | | |
| | | 0.91 | 0.09 | 4 | 0.825 | 0.175 | |
| J | Solid soln. III | 0.92 | 0.08 | 5 | | | |
| | | $t$ = 26°C | | | | | |
| | $ZnSO_4.7H_2O$ | | 1.00 | 7 | | | |
| K | Solid soln. I | 0.15 | 0.85 | 7 | | | |
| L | | 0.225 | 0.775 | 7 | 0.525 | 0.475 | |
| | Solid soln. II | 0.380 | 0.620 | 7 | | | |
| | | 0.488 | 0.512 | 7 | 0.603 | 0.397 | 11.70 |
| M | Solid soln. II | 0.50 | 0.500 | 7 | 0.625 | 0.375 | |
| N | Solid soln. IV | 0.780 | 0.220 | 4 | | | |
| | | 0.856 | 0.144 | 4 | 0.739 | 0.261 | 11.30 |
| | | $t$ = 32°C | | | | | |
| | $MnSO_4.4H_2O$ | 1.00 | | 4 | 1.00 | | 12.85 |
| | $ZnSO_4.7H_2O$ | | 1.00 | 7 | | 1.00 | 14.10 |
| O | Solid soln. I | 0.21 | 0.79 | 7 | 0.46 | 0.54 | |
| P | | 0.545 | 0.455 | 4 | | | |
| | Solid soln. IV | 0.700 | 0.300 | 4 | 0.566 | 0.434 | |
| | | 1.00 | | 4 | 1.00 | | 12.60 |
| | | $t$ = 38°C | | | | | |
| | $ZnSO_4.6H_2O$ | | 1.00 | 6 | | 1.00 | 12.90 |
| Q | Solid soln. V | 0.325 | 0.675 | 6 | 0.415 | 0.585 | |
| R | Solid soln. IV | 0.645 | 0.360 | 4 | | | |

* Rhombic. † Monoclinic. ‡ Triclinic.

$SO_4^{--}$ $Zn^{++}$ $Mg^{++}$ (212)

$H_2O + ZnSO_4 + MgSO_4$; *v.* Fig. 107

The author (212) determined the vapor pressures of eleven solid solutions containing as determined by analysis from 9 7 to 88.7% $MgSO_4.7H_2O$. He calculated the relative proportions of the two components, in the solutions from which these solids separated, from the volumes of saturated solutions of the component salts used in preparing the mixture. The relation between the compositions of the solid and liquid phases was shown by means of a graph (Fig. 107).

$SO_4^{--}$ $Zn^{++}$ $Na^{+}$ (233): $H_2O + ZnSO_4 + Na_2SO_4$

| Solid phases | Liquid phase: $t$ = 0°C % $Na_2SO_4$ | % $ZnSO_4$ | $t$ = 5°C % $Na_2SO_4$ | % $ZnSO_4$ | $t$ = 10°C % $Na_2SO_4$ | % $ZnSO_4$ | $t$ = 15°C % $Na_2SO_4$ | % $ZnSO_4$ | $t$ = 20°C % $Na_2SO_4$ | % $ZnSO_4$ | $t$ = 25°C % $Na_2SO_4$ | % $ZnSO_4$ | $t$ = 30°C % $Na_2SO_4$ | % $ZnSO_4$ | $t$ = 35°C % $Na_2SO_4$ | % $ZnSO_4$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $Na_2SO_4.10H_2O + ZnSO_4.7H_2O$ | 5.34 | 27.20 | 6.27 | 27.85 | | | | | | | | | | | | |
| $ZnSO_4.7H_2O + Na_2SO_4.ZnSO_4.4H_2O$ | | | | | 7.16 | 29.16 | 6.40 | 30.70 | 5.36 | 32.51 | 4.42 | 34.26 | 3.80 | 36.28 | 3.30 | 38.19 |
| $Na_2SO_4.ZnSO_4.4H_2O$ | | | | | | | | | | | 15.63 | 17.58 | 15.64 | 17.66 | 15.70 | 17.59 |
| $Na_2SO_4.ZnSO_4.4H_2O + Na_2SO_4.10H_2O$ | | | | | 7.92 | 27.91 | 10.90 | 24.08 | 14.58 | 19.12 | 19.94 | 13.31 | 27.76 | 6.96 | | |

| Solid phases | $t$ = 38°C % $Na_2SO_4$ | % $ZnSO_4$ | $t$ = 40°C % $Na_2SO_4$ | % $ZnSO_4$ |
|---|---|---|---|---|
| $ZnSO_4.6H_2O + Na_2SO_4.ZnSO_4.4H_2O$ | 2.90 | 38.83 | 2.78 | 38.26 |
| $Na_2SO_4.ZnSO_4.4H_2O$ | | | 15.72 | 17.75 |
| $Na_2SO_4.ZnSO_4.4H_2O + Na_2SO_4$ | 30.02* | 5.62* | 28.65 | 5.95 |

* $t$ = 35°C.

Transition temperatures

| °C | Solid phases | % $Na_2SO_4$ | % $ZnSO_4$ |
|---|---|---|---|
| −8.3 | $Na_2SO_4.10H_2O + ZnSO_4.7H_2O$ + Ice | | |
| −6.5 | $ZnSO_4.7H_2O$ + Ice | | |
| +8.7 | $Na_2SO_4.10H_2O + Na_2SO_4.ZnSO_4.4H_2O + ZnSO_4.7H_2O$ | 7.43 | 28.45 |
| 31.5 | $Na_2SO_4.10H_2O + Na_2SO_4.ZnSO_4.4H_2O + Na_2SO_4$ | | |
| 39 | $ZnSO_4.7H_2O + ZnSO_4.6H_2O$ | | |

**$SO_4^{--}$ $Zn^{++}$ $K^+$**

$H_2O + ZnSO_4 + K_2SO_4$

$t = 25°$ (72.5, 247)

| % $K_2SO_4$ | % $ZnSO_4$ |
|---|---|
| $ZnSO_4.7H_2O$ | |
| 0.0 | 37.00 |
| 1.00 | 35.60 |
| $ZnSO_4.7H_2O + ZnSO_4.K_2SO_4.6H_2O$ | |
| 1.48 | 35.30 |
| $ZnSO_4.K_2SO_4.6H_2O$ | |
| 2.48 | 25.90 |
| 3.40 | 17.90 |
| 4.80 | 9.10 |
| 6.33 | 6.00 |
| 7.53 | 3.90 |
| $ZnSO_4.K_2SO_4.6H_2O + K_2SO_4$ | |
| 8.33 | 3.00 |
| $K_2SO_4$ | |
| 10.90 | 2.00 |
| 10.80 | 0.0 |

**$SO_4^{--}$ $Hg^+$**

$H_2O + H_2SO_4 + Hg_2SO_4$

$t = 25°C$ (110)

| M ½$H_2SO_4$/l | M ½$Hg_2SO_4$/l |
|---|---|
| $Hg_2SO_4$ | |
| 0.0 | 0.001171 |
| 0.04 | 0.000831 |
| 0.10 | 0.000878 |
| 0.20 | 0.000804 |

**$SO_4^{--}$ $Hg^+$**

$H_2O + Hg_2O + Hg_2SO_4$

$t = 15$–$20°C$ (89)

| $M_{SO_3}$/l | $M_{Hg}$/l |
|---|---|
| $Hg_2O.SO_3 + 2Hg_2O.SO_3.H_2O$ | |
| 0.002 | 0.00214 |
| $2Hg_2O.SO_3.H_2O$ | |
| 0.0019 | 0.00198 |
| 0.0016 | 0.00177 |
| 0.0009 | 0.00098 |
| 0.00009 | 0.00024 |
| $2Hg_2O.SO_3.H_2O + Hg_2O$ | |
| 0.00005 | 0.000177 |

**$SO_4^{--}$ $Cd^{++}$ $Fe^{++}$**

$H_2O + CdSO_4 + FeSO_4$; *v.* Fig. 108

$t = 25°C$ (368)

| | Solid phases | Solid phases: Composition in M of: $CdSO_4$ | $FeSO_4$ | $H_2O$ | Liquid phase: Composition in M of: $CdSO_4$ | $FeSO_4$ | $H_2O$ |
|---|---|---|---|---|---|---|---|
| A | $FeSO_4.7H_2O$ | | 1 | 7 | | 3.165 | 100 |
| B | Solid soln. I* | 0.048 | 0.952 | 7 | | | |
| C | | 0.111 | 0.889 | 7 | | | |
| D | | 0.346 | 0.654 | 7 | | | |
| E | | 0.366 | 0.634 | 7 | | | |
| F | Solid soln. II† | 0.991 | 0.009 | calc. | 4.98 | 1.26 | 100 |
| G | $CdSO_4.\frac{8}{3}H_2O$ | 1 | 0 | calc. | 6.51 | | 100 |

* Solid soln. I (monoclinic) containing from 0 to 36.5 % $CdSO_4$.
† Solid soln. II (monoclinic) containing from 99.1 to 100 % $CdSO_4$.

**$SO_4^{--}$ $Cd^{++}$ $Na^+$**; *v.* p. 340

**$SO_4^{--}$ $Hg^{++}$ (210)**

$H_2O + H_2SO_4 + HgO$; *v.* Fig. 109

| | Solid phases | Liquid phase: $t = 25°C$ % HgO | % $SO_3$ | $t = 50°C$ % HgO | % $SO_3$ |
|---|---|---|---|---|---|
| A | $3HgO.SO_3$ | 3.68 | 5.10 | 1.94 | 4.06 |
| | | 9.22 | 9.32 | 9.35 | 11.23 |
| | | 22 87m | 17.40m | 16 56 | 15.85 |
| | $3HgO.SO_3 + 3HgO.2SO_3.2H_2O$ | 17.38 | 14.15 | 17.26 | 18.44 |
| B | | 17.00 | 15.44 | 18.07 | 17.93 |
| | $3HgO.2SO_3.2H_2O$, at 25°C | 17.16 | 17.98 | | |
| | $HgO.SO_3$, at 50°C | 17.15 | 19.90 | | |
| C | $3HgO.2SO_3.2H_2O + HgO.SO_3.H_2O$ | 16.69 | 20.67 | | |
| D | $3HgO.2SO_3.2H_2O + HgO.SO_3$ | | | 18.03 | 19.30 |
| | $HgO.SO_3.H_2O$ | 15.08 | 21.35 | | |
| | $HgO.SO_3$ | 2.35 | 32.81 | 17.78 | 19.67 |
| | | 0.23 | 44.66 | 11.60 | 22.41 |
| | | | | 2.01 | 32.95 |
| E | $HgO.SO_3.H_2O + HgO.SO_3$ | 5.36 | 26.71 | | |
| F | $3HgO.SO_3 + HgO.SO_3$ | | | 20.53 | 18.60 |

$t = 25°C$ (89)

| $M_{H_2O}$/l | $M_{SO_3}$/l | $M_{HgO}$/l | $M_{SO_3}$/l |
|---|---|---|---|
| $HgO.SO_3 + 3HgO.SO_3$ | | $3HgO.SO_3$ | |
| 1.102 | 3.435 | 0.0979 | 0.398 |
| $3HgO.SO_3$ | | 0.0007 | 0.0129 |
| 0.060 | 2.327 | $3HgO.SO_3 + HgO$ | |
| 0.1976 | 0.717 | 0.00015 | 0.00063 |

**$SO_4^{--}$ $Cu^{++}$**

$H_2O + H_2SO_4 + Cu(OH)_2$; *v.* Fig. 110

$t = 25°C$ (32); *v. also* p. 341

| | Solid phases | Liquid phase: % CuO | % $SO_3$ |
|---|---|---|---|
| A | Basic salts | 1.165 | |
| B | | 8.720 | |
| C | $CuSO_4.5H_2O$ | 9.17 | 9.26 |
| D | | 3.39 | 23.09 |
| E | $CuSO_4.5H_2O + CuSO_4.3H_2O$ | | 41.29 |
| F | $CuSO_4.3H_2O$ | 1.38 | 43.63 |
| G | | 1.02 | 47.82 |
| H | | | 49.07 |
| I | $CuSO_4.H_2O$ | 0.109 | 62.14 |
| J | | 0.15 | 72.41 |
| K | $CuSO_4$ | 0.07 | 74.26 |

**$SO_4^{--}$ $Cu^{++}$ $Mn^{++}$ (213)**

$H_2O + CuSO_4 + MnSO_4$; *v.* Fig. 111

| Solid solns.* | Solid phases: Composition in M of: $CuSO_4$ | $MnSO_4$ | $H_2O$ | Liquid phase: Composition in M of: $CuSO_4$ | $MnSO_4$ | $H_2O$ |
|---|---|---|---|---|---|---|
| | $t = 0°C$ | | | | | |
| I† | | 1.00 | 7 | | 1.0 | 15.12 |
| | 0.029 | 0.971 | 7 | 0.022 | 0.978 | 16.05 |
| | 0.095 | 0.905 | 7 | 0.045 | 0.955 | 16.74 |
| | 0.202 | 0.798 | 7 | 0.101 | 0.899 | 18.08 |
| | 0.273 | 0.727 | 7 | 0.152 | 0.848 | 19.02 |
| | 0.329 | 0.671 | 7 | 0.221 | 0.779 | 19.95 |
| | 0.360 | 0.640 | 7 | 0.290 | 0.710 | 20.40 |
| | 0.780 | 0.220 | 5 | | | |
| II‡ | 0.787 | 0.213 | 5 | 0.301 | 0.699 | 21.61 |
| | 0.823 | 0.177 | 5 | 0.376 | 0.624 | 26.17 |
| | 0.866 | 0.134 | 5 | 0.466 | 0.534 | 30.59 |
| | 0.893 | 0.107 | 5 | 0.603 | 0.397 | 36.40 |
| | 0.936 | 0.064 | 5 | 0.756 | 0.244 | 41.16 |
| | 1.000 | | 5 | 1.000 | | 46.47 |
| | $t = 17°C$ | | | | | |
| III‡ | | 1.0 | 5 | | 1.00 | 13.08 |
| | 0.048 | 0.952 | 5 | 0.031 | 0.969 | 13.37 |
| | 0.071 | 0.929 | 5 | 0.064 | 0.936 | 13.46 |
| | 0.090 | 0.910 | 5 | 0.08 | 0.920 | 13.50 |
| | 0.185 | 0.815 | 7 | | | |
| IV† | 0.191 | 0.809 | 7 | 0.085 | 0.915 | 13.61 |
| | 0.205 | 0.795 | 7 | 0.112 | 0.888 | 14.31 |
| | 0.245 | 0.755 | 7 | 0.162 | 0.838 | 14.72 |
| | 0.270 | 0.730 | 7 | 0.190 | 0.810 | 14.80 |
| | 0.560 | 0.443 | 5 | | | |
| V‡ | 0.567 | 0.433 | 5 | 0.191 | 0.809 | 15.05 |
| | 0.621 | 0.379 | 5 | 0.237 | 0.763 | 17.88 |
| | 0.700 | 0.300 | 5 | 0.318 | 0.682 | 21.18 |
| | 0.756 | 0.244 | 5 | 0.425 | 0.575 | 25.19 |
| | 0.848 | 0.152 | 5 | 0.573 | 0.427 | 30.22 |
| | 0.946 | 0.054 | 5 | 0.821 | 0.179 | 37.35 |
| | 1.000 | | 5 | 1.000 | | 39.48 |

* Solid soln. are I, II, etc., as indicated.
† Monoclinic.
‡ Triclinic.

Transition temperatures (88.5)

At 9°C, $MnSO_4.7H_2O \rightarrow MnSO_4.5H_2O$.

At 26°C, $MnSO_4.5H_2O \rightarrow MnSO_4.4H_2O$.

**$SO_4^{--}$ $Cu^{++}$ $Ca^{++}$; $SO_4^{--}$ $Cu^{++}$ $Li^+$; $SO_4^{--}$ $Cu^{++}$ $Na^+$; $SO_4^{--}$ $Cu^{++}$ $K^+$**; *v.* p. 341, 342

$SO_4^{--}$ $Cd^{++}$ $Na^+$ (233)

$H_2O + CdSO_4 + Na_2SO_4$

| Solid phases | Liquid phase—determinations largely mean of several results | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t = -14.8°C$ | | $t = 0°C$ | | $t = 5°C$ | | $t = 10°C$ | | $t = 15°C$ | | $t = 20°C$ | |
| | % $CdSO_4$ | % $Na_2SO_4$ | % $CdSO_4$ | % $Na_2SO_4$ | % $CdSO_4$ | % $Na_2SO_4$ | % $CdSO_4$ | % $Na_2SO_4$ | % $CdSO_4$ | % $Na_2SO_4$ | % $CdSO_4$ | % $Na_2SO_4$ |
| $CdSO_4.Na_2SO_4.2H_2O + Na_2SO_4.10H_2O$ | 40.18 | 4.60 | | | | | | | | | | |
| $CdSO_4.\frac{8}{3}H_2O + CdSO_4.Na_2SO_4.2H_2O$ | | | 40.35 | 4.85 | 40.31 | 4.76 | 39.91 | 5.24 | 40.27 | 5.15 | 40.26 | 5.16 |
| $CdSO_4.Na_2SO_4.2H_2O + Na_2SO_4.10H_2O$ | 30.81* | 9.52* | 37.30 | 6.54 | 35.35 | 7.42 | 32.53 | 8.69 | 28.32 | 10.93 | 22.69 | 14.72 |

| Solid phases | Liquid phase—determinations largely mean of several results | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $t = 24°C$ | | $t = 25°C$ | | $t = 30°C$ | | $t = 35°C$ | | $t = 40°C$ | |
| | % $CdSO_4$ | % $Na_2SO_4$ | % $CdSO_4$ | % $Na_2SO_4$ | % $CdSO_4$ | % $Na_2SO_4$ | % $CdSO_4$ | % $Na_2SO_4$ | % $CdSO_4$ | % $Na_2SO_4$ |
| $CdSO_4.\frac{8}{3}H_2O + CdSO_4.Na_2SO_4.2H_2O$ | | | 40.00 | 5.69 | 39.95 | 6.00 | 40.08 | 6.43 | 39.90 | 7.18 |
| $CdSO_4.Na_2SO_4.2H_2O$ | 22.25 | 15.07 | 22.38 | 15.25 | 22.55 | 15.30 | 22.70 | 15.45 | 22.89 | 15.65 |
| $CdSO_4.Na_2SO_4.2H_2O + Na_2SO_4.10H_2O$ | 17.72 | 18.58 | 16.34 | 19.82 | 9.21 | 27.80 | 8.28† | 29.36† | 10.00† | 28.47† |

Invariant points

| °C | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % $CdSO_4$ | % $Na_2SO_4$ |
| −17.7 | $CdSO_4.\frac{8}{3}H_2O + Na_2SO_4.10H_2O$ + Ice | | |
| −16.9 | $CdSO_4.\frac{8}{3}H_2O$ + Ice | | |
| −14.8 | $CdSO_4.\frac{8}{3}H_2O + CdSO_4.Na_2SO_4.2H_2O + Na_2SO_4.10H_2O$ | 40.21 | 4.59 |
| +31 | $Na_2SO_4.10H_2O + CdSO_4.Na_2SO_4.2H_2O + Na_2SO_4$ | | |

*$t = +12°C$.

† Solid phase = $CdSO_4.Na_2SO_4.2H_2O + Na_2SO_4$.

$SO_4^{--}$ $Cu^{++}$ $Na^+$ (135)

$H_2O + H_2SO_4 + CuSO_4 + Na_2SO_4$; *v.* Fig. 112 and p. 342

| | Solid phases | Liquid phase | | | | | |
|---|---|---|---|---|---|---|---|
| | | $t = 12°C$ | | | $t = 25°C$ | | |
| | | % $CuSO_4$ | % $H_2SO_4$ | % $Na_2SO_4$ | % $CuSO_4$ | % $H_2SO_4$ | % $Na_2SO_4$ |
| A | $CuSO_4.5H_2O$ | 16.15 | | | 18.47 | | |
| B | $CuSO_4.5H_2O + CuSO_4.3H_2O$ | 1.64 | 51.50 | | 2.83 | 49.20 | |
| C | $CuSO_4.3H_2O + CuSO_4.H_2O$ | 0.81 | 61.54 | | 2.13 | 55.72 | |
| D | $NaHSO_4.H_2O$ | | 58.79 | 4.33 | | 56.25 | 6.54 |
| E | $NaHSO_4.H_2O + Na_3H(SO_4)_2$ | | 27.96 | 25.42 | | 30.58 | 27.02 |
| F | $Na_3H(SO_4)_2 + Na_2SO_4$ | | | | | 16.27 | 35.37 |
| G | $Na_2SO_4 + Na_2SO_4.10H_2O$ | | | | | 8.62 | 33.48 |
| H | $Na_2SO_4.10H_2O$ | | | 9.49 | | | 21.90 |
| I | $Na_2SO_4.10H_2O + CuSO_4.Na_2SO_4.2H_2O$ | | | | 6.28 | | 21.20 |
| J | $CuSO_4.Na_2SO_4.2H_2O + CuSO_4.5H_2O$ | | | | 16.85 | | 10.95 |
| | $Na_2SO_4.10H_2O + Na_3H(SO_4)_2$ | | 32.93 | 16.51 | | | |
| | $Na_2SO_4.10H_2O + CuSO_4.5H_2O$ | 14.60 | | 10.44 | | | |
| P | $CuSO_4.5H_2O + CuSO_4.3H_2O + CuSO_4.Na_2SO_4.2H_2O$ | 1.59 | 50.54 | 2.51 | 2.86 | 47.08 | 2.90 |
| Q | $CuSO_4.3H_2O + CuSO_4.H_2O + CuSO_4.Na_2SO_4.2H_2O$ | 0.73 | 59.91 | 2.70 | 2.17 | 53.98 | 2.50 |
| | $CuSO_4.5H_2O + Na_2SO_4.10H_2O + CuSO_4.Na_2SO_4.2H_2O$ | 8.74 | 7.41 | 13.66 | | | |
| R | $NaHSO_4.H_2O + CuSO_4.Na_2SO_4.2H_2O$ | 0.77 | 58.20 | 4.63 | 0.78 | 55.52 | 6.58 |
| S | $Na_3H(SO_4)_2 + NaHSO_4.H_2O + CuSO_4.Na_2SO_4.2H_2O$ | 0.11 | 27.92 | 25.42 | 0.18 | 30.46 | 27.00 |
| T | $Na_2SO_4 + Na_3H(SO_4) + CuSO_4.Na_2SO_4.2H_2O$ | 0.15 | 16.52 | 32.91 | | | |
| | $Na_2SO_4 + Na_3H(SO_4)_2 + CuSO_4.Na_2SO_4.2H_2O$ | | | | 0.19 | 16.19 | 35.86 |
| U | $Na_2SO_4.10H_2O + Na_2SO_4 + CuSO_4.Na_2SO_4.2H_2O$ | | | | 0.44 | 8.58 | 33.30 |

**$SO_4^{--}$ $Cu^{++}$.**—(*Continued from p. 339*)

$t$ = 25°C (134)

| % $CuSO_4$ | % $H_2SO_4$ |
|---|---|
| $CuSO_4.5H_2O$ | |
| 18.47 | 0 |
| 12.62 | 11.41 |
| 5.92 | 25.53 |
| 3.25 | 36.77 |
| 2.63 | 42.15 |
| 2.59 | 47.66 |
| $CuSO_4.5H_2O$ + $CuSO_4.3H_2O$ | |
| 2.83 | 49.23 |
| $CuSO_4.3H_2O$ | |
| 2.70 | 50.23 |
| 2.19 | 54.78 |
| $CuSO_4.3H_2O$ + $CuSO_4.H_2O$ | |
| 2.13 | 55.72 |
| $CuSO_4.H_2O$ | |
| 0.95 | 61.79 |
| 0.17 | 77.93 |
| 0.15 | 83.29 |
| 0.19 | 85.46 |
| $CuSO_4.H_2O$ + $CuSO_4$ | |
| 0.43 | 85.76 |
| $CuSO_4$ | |
| 0.40 | 86.04 |
| 0.19 | 92.70 |

**$SO_4^{--}$ $Cu^{++}$ $Ca^{++}$**

$H_2O$ + $CuSO_4$ + $Ca(OH)_2$

$t$ = 25°C (30)

| g CaO/l | g $SO_3$/l |
|---|---|
| $CaO.H_2O$ + $CuO.(H_2O)_x$, blue | |
| 1.20 | 0.0 |
| 1.78 | 0.872 |
| $CaO.H_2O$ + $CuO.(H_2O)_x$ + $CaSO_4.2H_2O$ | |
| 1.908 | 1.060 |
| $CaSO_4.2H_2O$ + $CuO.(H_2O)_x$, blue | |
| 1.888 | 1.052 |
| 1.816 | 1.032 |
| 1.420 | 1.084 |
| 1.358 | 1.112 |
| $CaSO_4.2H_2O$ + $CuO.(H_2O)_x$, green | |
| 1.120 | 1.144 |
| 1.008 | 1.156 |
| 0.880 | 1.280 |

**$SO_4^{--}$ $Cu^{++}$ $Ca^{++}$**

$H_2O$ + $CuSO_4$ + $CaSO_4$

$t$ = 25°C (30)

| % $CaSO_4$ | % $CuSO_4$ |
|---|---|
| $CaSO_4.2H_2O$ | |
| 0.2064 | 0.1142 |
| 0.1976 | 0.3546 |
| 0.1930 | 0.6005 |
| 0.1841 | 0.7214 |
| 0.1732 | 1.4581 |
| 0.1700 | 1.9323 |
| 0 1639 | 2.8682 |
| 0.1650 | 3.7855 |
| 0.1659 | 4.6980 |
| 0.1679 | 5.5495 |
| 0.1758 | 8.9207 |

**$SO_4^{--}$ $Cu^{++}$ $Ca^{++}$.**—(*Cont'd*)

| % $CaSO_4$ | % $CuSO_4$ |
|---|---|
| $CaSO_4.2H_2O$ | |
| 0.1787 | 12.803 |
| 0.1741 | 16.444 |
| $CaSO_4.2H_2O$ + $CuSO_4.5H_2O$ | |
| 0.1714 | 18.466 |
| $t$ = 25°C (162) | |
| $CaSO_4.2H_2O$ | |
| 0.20854 | 0.0 |
| 0.18435 | 0.1996 |
| 0.1671 | 0.7922 |
| 0.1661 | 1.5842 |
| 0.17468 | 3.267 |
| 0.1944 | 13.465 |

**$SO_4^{--}$ $Cu^{++}$ $Li^+$**

$H_2O$ + $CuSO_4$ + $Li_2SO_4$

$t$ = 30°C (338)

| % $CuSO_4$ | % $Li_2SO_4$ |
|---|---|
| $CuSO_4.5H_2O$ | |
| 20.32 | 0.0 |
| 17.50 | 3.54 |
| 16.10 | 6.08 |
| 13.55 | 11.94 |
| 12.14 | 15.72 |
| 11.04 | 17.92 |
| $CuSO_4.5H_2O$ + $Li_2SO_4.H_2O$ | |
| 10.07 | 20.52 |
| $Li_2SO_4.H_2O$ | |
| 6.41 | 22.23 |
| 3.39 | 23.59 |
| 0.0 | 25.24 |

**$SO_4^{--}$ $Ag^+$**

$H_2O$ + $H_2SO_4$ + $Ag_2SO_4$

$t$ = 25°C (110)

| M ½$H_2SO_4$/l | M ½$Ag_2SO_4$/l |
|---|---|
| | $Ag_2SO_4$ |
| 0.0 | 0.0257 |
| 0.02 | 0.0260 |
| 0.04 | 0.0264 |
| 0.10 | 0.0271 |
| 0.20 | 0.0275 |

**$SO_4^{--}$ $Ag^+$ $Cr_2O_7^{--}$**

$H_2O$ + $Ag_2SO_4$ + $Ag_2Cr_2O_7$

$t$ = 25°C (389)

| g Ag/l | g $SO_4$/l | g $Cr_2O_7$/l |
|---|---|---|
| | $Ag_2SO_4$ | |
| 6.484 | 1.476 | |
| Solid soln. I | | |
| 6.580 | 1.4772 | 0.296 |
| 6.484 | 1.46664 | 0.296 |
| Solid soln. I + $Ag_2Cr_2O_7$ | | |
| 6.448 | 1.4664 | 0.272 |
| | $Ag_2Cr_2O_7$ | |
| 6.520 | 1.4468 | 0.304 |
| 5.524 | 1.4304 | 0.372 |
| 0.2332 | | 0.920 |

**$SO_4^{--}$ $Ag^+$ $Ca^{++}$ $K^+$**

$H_2O$ + $Ag_2SO_4$ + $CaSO_4$ + $K_2SO_4$; $t$ = 25°C (94)

M per 1000M $H_2O$

| $Ag_2SO_4$ | $K_2SO_4$ | $CaSO_4$ |
|---|---|---|
| $CaSO_4.2H_2O$ + $CaSO_4.K_2SO_4.H_2O$ + $Ag_2SO_4$ | | |
| 0.551 | 3.35 | 0.242 |

**$SO_4^{--}$ $Cu^{++}$ $Na^+$**; *v.* p. 340 and 342

**$SO_4^{--}$ $Cu^{++}$ $K^+$ (73)**

$H_2O$ + $CuSO_4$ + $K_2SO_4$

| Solid phases | Liquid phase—M per 1000M $H_2O$ | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 25°C | | $t$ = 51°C | | $t$ = 61°C | |
| | $CuSO_4$ | $K_2SO_4$ | $CuSO_4$ | $K_2SO_4$ | $CuSO_4$ | $K_2SO_4$ |
| $CuSO_4.5H_2O$ | 1.410 | | 2.073 | | 2.419 | |
| | 1.415 | 0.014 | | | | |
| | 1.430 | 0.037 | | | | |
| | 1.457 | 0.086 | | | | |
| | 1.477 | 0.110 | | | | |
| | 1.504 | 0.150 | | | | |
| $CuSO_4.5H_2O$ + $CuSO_4.K_2SO_4.6H_2O$ | 1.570 | 0.225 | 2.266 | 0.618 | 2.586 | 0.838 |
| $CuSO_4.K_2SO_4.6H_2O$ | 1.525 | 0.228 | 0.677 | 0.706 | 0.728 | 0.932 |
| | 1.119 | 0 261 | | | | |
| | 0.955 | 0.270 | | | | |
| | 0.365 | 0.331 | | | | |
| | 0.350 | 0.350 | | | | |
| | 0.237 | 0.412 | | | | |
| | 0.120 | 0.598 | | | | |
| $CuSO_4.K_2SO_4.6H_2O$ + $K_2SO_4$ | 0.092 | 0.737 | 0.312 | 1.036 | 0.422 | 1.187 |
| $K_2SO_4$ | 0.060 | 0.708 | | 0.923 | | 1.064 |
| | | 0.661 | | | | |

**$SO_4^{--}$ $Ag^+$ $Na^+$ (20)**

$H_2O$ + $Ag_2SO_4$ + $Na_2SO_4$; liquid phase in g per 100g $H_2O$

| $t$ = 33°C | | $t$ = 51°C | | $t$ = 75°C | | $t$ = 100°C | |
|---|---|---|---|---|---|---|---|
| $Ag_2SO_4$ | $Na_2SO_4$ | $Ag_2SO_4$ | $Na_2SO_4$ | $Ag_2SO_4$ | $Na_2SO_4$ | $Ag_2SO_4$ | $Na_2SO_4$ |
| Solid soln. | | | | | | | |
| 0.972 | 5.345 | 1.173 | 5.407 | 1.458 | 5.368 | 1.651 | 5.336 |
| 1.150 | 10.056 | 1.377 | 10.116 | 1.697 | 9.813 | 2.012 | 10.153 |
| 1.320 | 15.185 | 1.572 | 15.146 | 1.934 | 15.260 | 2.312 | 15.532 |
| 1.448 | 20.093 | 1.705 | 20.247 | 2.075 | 19.978 | 2.351 | 25.452 |
| 1.548 | 25.412 | 1.787 | 25.196 | 2.161 | 25.556 | 2.260 | 29.714 |
| 1.570 | 29.556 | 1.802 | 29.230 | 2.138 | 29.662 | 2.012 | 34.718 |
| 1.549 | 34.732 | 1.727 | 34.625 | 1.910 | 35.278 | 1.687 | 38.635 |
| 1.462 | 39.447 | 1.540 | 39.302 | 1.603 | 38.944 | 1.158 | 40.160 |
| 1.199 | 44.693 | 1.188 | 42.914 | 1.156 | 41.365 | | |
| 0.932 | 46.976 | 0.882 | 44.464 | | | | |

For temperatures above 33°C, Barre (20) found a continuous series of solid solutions for the concentrations studied; the curves representing the ratios of $Na_2SO_4$ to $Ag_2SO_4$ in solutions saturated with this solid all showed a maximum corresponding to the points at which the solid phase contained 40% $Na_2SO_4$. Below 33°C the solubility of $Ag_2SO_4$ increased with increasing $Na_2SO_4$.

**$SO_4^{--}$ $Ag^+$ $K^+$**

$H_2O$ + $Ag_2SO_4$ + $K_2SO_4$

$t$ = 25°C (110)

| M ½$K_2SO_4$/l | M ½$Ag_2SO_4$/l |
|---|---|
| | $Ag_2SO_4$ |
| 0.0 | 0.0257 |
| 0.02 | 0.0246 |
| 0.04 | 0.0236 |
| 0.10 | 0.0231 |
| 0.20 | 0.0232 |

**$SO_4^{--}$ $Mn^{++}$ $Na^+$**

$H_2O$ + $MnSO_4$ + $Na_2SO_4$

$t$ = 35°C (346)

| % $MnSO_4$ | % $Na_2SO_4$ |
|---|---|
| $MnSO_4.H_2O$ | |
| 39.45 | 0.0 |
| 33.92 | 5.23 |
| $MnSO_4.H_2O$ + 9$MnSO_4$.10$Na_2SO_4$ | |
| 32.91* | 7.70* |

**$SO_4^{--}$ $Mn^{++}$ $Na^+$.**—(*Cont'd*)

| % $MnSO_4$ | % $Na_2SO_4$ |
|---|---|
| 9$MnSO_4$.10$Na_2SO_4$ | |
| 31.05 | 9.20 |
| 27.67 | 10.76 |
| 22.14 | 14.28 |
| 14.58 | 20.01 |
| 9$MnSO_4$.10$Na_2SO_4$ + $MnSO_4.3Na_2SO_4$ | |
| 13.96 | 21.91 |
| $MnSO_4.3Na_2SO_4$ | |
| 12.19 | 22.49 |
| 10.45 | 23.41 |
| 7.43 | 26.58 |
| 5.69 | 29.31 |
| $MnSO_4.3Na_2SO_4$ + $Na_2SO_4$ | |
| 5.11 | 30.52 |
| $Na_2SO_4$ | |
| 2.96 | 31.33 |
| 0 | 33.0 |

* Average of several determinations.

### $SO_4^{--}$ $Cu^{++}$ $Na^+$ (232, 345)

$H_2O + CuSO_4 + Na_2SO_4$; *v.* Fig. 113

| Solid phases | Liquid phase (232)*—% A = % $CuSO_4$; % B = % $Na_2SO_4$ (largely mean of two or more results) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 10°C | | $t$ = 12°C | | $t$ = 15°C | | $t$ = 17.7°C | |
| | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B |
| $CuSO_4.5H_2O + Na_2SO_4.10H_2O$ | 13.40 | 6.23 | 14.90 | 9.46 | 14.83 | 9.82 | 15.09 | 11.64 | | |
| $CuSO_4.5H_2O + CuSO_4.Na_2SO_4.2H_2O$ | | | | | | | | | 14.99 | 13.48? |
| $CuSO_4.Na_2SO_4.2H_2O$ | | | | | | | | | 14.34 | 13.34 |
| | $t$ = 26°C | | | | $t$ = 32.2°C | | | | | |
| $CuSO_4.Na_2SO_4.2H_2O + Na_2SO_4.10H_2O$ | 5.51 | 22.45 | | | 1.47 | 32.44 | | | | |

| Solid phases | Liquid phase (232)*—% A = % $CuSO_4$; % B = % $Na_2SO_4$ (largely mean of two or more results) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t$ = 19.5°C | | $t$ = 23°C | | $t$ = 30°C | | $t$ = 40.15°C | |
| | % A | % B | % A | % B | % A | % B | % A | % B |
| $CuSO_4.5H_2O + CuSO_4.Na_2SO_4.2H_2O$ | 15.62 | 12.06 | 16.40 | 11.35 | 17.97 | 9.95 | 20.56 | |
| $CuSO_4.Na_2SO_4.2H_2O$ | 14.54 | 12.90 | 14.37 | 12.76 | 14.07 | 12.37 | 13.73 | 12.26 |
| $CuSO_4.Na_2SO_4.2H_2O + Na_2SO_4.10H_2O$ | 11.84 | 15.12 | 8.19 | 18.72 | 2.61 | 28.38 | | |

| Solid phases | Liquid phase—g per 100g $H_2O$ (345)—A = $CuSO_4$; B = $Na_2SO_4$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t$ = 15°C | | $t$ = 20°C† | | $t$ = 25°C | | $t$ = 35°C | |
| | A | B | A | B | A | B | A | B |
| $CuSO_4.5H_2O$ | 16.05 | 0 | 17.52 | 0 | 18.24 | 0 | 21.06 | 0 |
| $CuSO_4.5H_2O + CuSO_4.Na_2SO_4.2H_2O$ | | | 15.54 | 11.85 | 16.86 | 10.97 | 19.28 | 8.98 |
| $CuSO_4.Na_2SO_4.2H_2O + Na_2SO_4.10H_2O$ | | | 11.22 | 15.45 | 6.28 | 21.18 | | |
| $CuSO_4.5H_2O + Na_2SO_4.10H_2O$ | 14.88 | 11.42 | | | | | | |
| $Na_2SO_4.10H_2O$ | 0 | 11.63 | 0 | 16.25 | 0 | 21.89 | | |
| $CuSO_4.Na_2SO_4.2H_2O + Na_2SO_4$ | | | | | | | 1.46 | 32.12 |
| $Na_2SO_4$ | | | | | | | 0 | 33.07 |

* Some of these data were compiled by Koppel (232) from other sources. † Data from Massink (255).

Invariant points (232)

| °C | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % $CuSO_4$ | % $Na_2SO_4$ |
| − 3 | $CuSO_4.5H_2O + Na_2SO_4.10H_2O$ + Ice | | |
| − 2 | $CuSO_4.5H_2O$ + Ice | | |
| +16 7 | $CuSO_4.5H_2O + CuSO_4.Na_2SO_4.2H_2O + Na_2SO_4.10H_2O$ | 15.02 | 12.62 |
| 32 | $Na_2SO_4.10H_2O + CuSO_4.Na_2SO_4.2H_2O + Na_2SO_4$ | | |

### $SO_4^{--}$ $Mn^{++}$ $K^+$

$H_2O + MnSO_4 + K_2SO_4$

$t$ = 25°C (72.5)

| % $MnSO_4$ | % $K_2SO_4$ |
|---|---|
| | $K_2SO_4$ |
| 0 | 10.59 |
| 6.30 | 11.27 |
| 15.22 | 12.04 |
| | $K_2SO_4 + K_2SO_4.MnSO_4.6H_2O$ |
| 16.58 | 12.31 |
| | $K_2SO_4.MnSO_4.6H_2O$ |
| 19.27 | 10.06 |
| 30.47 | 5.27 |
| 35.58 | 4.30 |
| 37.28 | 4.20 |
| | $MnSO_4.4H_2O + K_2SO_4.MnSO_4.6H_2O$ |
| 37.92 | 4.15 |
| | $MnSO_4.4H_2O$ |
| 38.21 | 3.03 |
| 38.42 | 2.46 |
| 38.54 | 1.87 |

### $SO_4^{--}$ $Mn^{++}$ $K^+$.—(*Cont'd*)

| % $MnSO_4$ | % $K_2SO_4$ |
|---|---|
| | $MnSO_4.4H_2O$ |
| 39.03 | 0.43 |
| 39.10 | 0 |

### $SO_4^{--}$ $MnO_4^-$ $Na^+$ $K^+$

$H_2O + Na_2SO_4 + KMnO_4$

$t$ = 25°C (386)

| % $KMnO_4$ | % $Na_2SO_4$ |
|---|---|
| | $KMnO_4$ |
| 7.10 | 0.00 |
| 7.33 | 0.88 |
| 7.83 | 4.62 |
| 7.75 | 7.05 |
| 7.67 | 9.34 |
| 7.27 | 12.85 |
| 6.68 | 17.05 |
| 6.25 | 19.43 |
| | $KMnO_4 + Na_2SO_4.10H_2O$ |
| 5.91 | 21.04 |
| | $NaSO_4.10H_2O$ |
| 0.0 | 21.80 |

### $SO_4^{--}$ $MnO_4^-$ $K^+$; *v.* p. 343

### $SO_4^{--}$ $Fe^{++}$: $H_2O + H_2SO_4 + FeO$

$t$ = 25°C (228); *v.* Fig. 114 and p. 343

| | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % FeO | % $SO_3$ |
| A | $FeO.SO_3.7H_2O$ | 5.55 | 21.56 |
| B | $FeO.SO_3.4H_2O + FeO.SO_3.7H_2O$ | 4.05 | 31.78 |
| C | $FeO.SO_3.7H_2O + FeO.SO_3.H_2O$ | 3.30 | 34.78 |
| D | $FeO.SO_3.H_2O$ | 0.026 | 58.12 |
| E | $FeO.SO_3.H_2O + 2FeO.3SO_3.2H_2O$ | 0.066 | 66.98 |
| F | $2FeO.3SO_3.2H_2O$ | 0.070 | 70.78 |
| G | $2FeO.3SO_3.2H_2O + FeO.2SO_3.H_2O$ | 0.09 | 73.01 |
| H | $FeO.2SO_3.H_2O + FeO.4SO_3.3H_2O$ | | 76.80 |
| I | $FeO.4SO_3.3H_2O$ | 0.014 | 79.81 |

### $SO_4^{--}$ $Fe^{++}$ $Li^+$; *v.* p. 343

### $SO_4^{--}$ $Fe^{++}$ $K^+$ (239): $H_2O + FeSO_4 + K_2SO_4$

Solubility data which seem to indicate that in solutions containing equivalent proportions of $FeSO_4$ and $K_2SO_4$ the following equilibria exist:

$K_2SO_4.FeSO_4.6H_2O \leftrightarrow K_2SO_4.FeSO_4.4H_2O$ at 30°C.

$K_2SO_4.FeSO_4.4H_2O \leftrightarrow K_2SO_4.FeSO_4.2H_2O$ at 87°C.

$K_2SO_4.FeSO_4.6H_2O \leftrightarrow K_2SO_4.FeSO_4.2H_2O$ at 54°C (metastable).

**$SO_4^{--}$ $MnO_4^-$ $K^+$**
$H_2O + K_2SO_4 + KMnO_4$
$t$ = 25°C (386)

| % $KMnO_4$ | % $K_2SO_4$ |
|---|---|
| $KMnO_4$ | |
| 7.10 | 0.00 |
| 6.59 | 0.80 |
| 5.92 | 1.98 |
| 4.52 | 4.57 |
| 3.87 | 7.79 |
| $KMnO_4 + K_2SO_4$ | |
| 3.55 | 9.26 |

**$SO_4^{--}$ $Fe^{++}$**
$H_2O + H_2SO_4 + FeSO_4$
$t$ = 25°C (396)

| M ½$H_2SO_4$/l | % $FeSO_4$ |
|---|---|
| $FeSO_4.7H_2O$(?)* | |
| 0.0 | 22.84 |
| 2.25 | 19.03 |
| 6.685 | 13.40 |
| 10.20 | 10.30 |
| $FeSO_4.H_2O$ | |
| 12.46 | 7.26 |
| 15.15 | 4.015 |
| 19.84 | 0.1522 |

* Excess of $FeSO_4.7H_2O$ used.

**$SO_4^{--}$ $Fe^{++}$ $Li^+$**
$H_2O + FeSO_4 + Li_2SO_4$
$t$ = 30°C (343)

| % $FeSO_4$ | % $Li_2SO_4$ | % $FeSO_4$ | % $Li_2SO_4$ |
|---|---|---|---|
| $FeSO_4.7H_2O$ | | $Li_2SO_4.H_2O$ | |
| 24.87 | 0 | 15.39 | 16.80 |
| 22.45 | 4 | 12.68 | 18.31 |
| 21.15 | 5.58 | 5.32 | 22.15 |
| 18.79 | 11.16 | 3.74 | 23.15 |
| 16.51 | 15.81 | 0 | 25.10 |
| $FeSO_4.7H_2O$ + $Li_2SO_4.H_2O$ | | | |
| 16.11* | 16.51* | | |

* Average of two or more results.

**$SO_4^{--}$ $Fe^{++}$ $Na^+$ (233)**
$H_2O + FeSO_4 + Na_2SO_4$

| Solid phases | Liquid phase (largely mean of two or more results)— % A = % $FeSO_4$; % B = % $Na_2SO_4$ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 15.5°C | | $t$ = 18.8°C | | $t$ = 23°C | | $t$ = 24.92°C | |
| | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B |
| $FeSO_4.7H_2O + Na_2SO_4.10H_2O$ | 14.54 | 4.95 | 17.76 | 11.32 | | | | | | |
| $FeSO_4.7H_2O + FeSO_4.Na_2SO_4.4H_2O$ | | | | | 18.13 | 13.80 | 19.58 | 12.50 | | |
| $FeSO_4.Na_2SO_4.4H_2O$ | | | | | | | | | 16.22 | 15.13 |
| $FeSO_4.Na_2SO_4.4H_2O + Na_2SO_4.10H_2O$ | | | | | 18.23 | 14.83 | 13.83 | 18.04 | | |

| Solid phases | Liquid phase (largely mean of two or more results)— % A = % $FeSO_4$; % B = % $Na_2SO_4$ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 27°C | | $t$ = 28°C | | $t$ = 31°C | | $t$ = 35°C | | $t$ = 40°C | |
| | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B |
| $FeSO_4.7H_2O + FeSO_4.Na_2SO_4.4H_2O$ | 20.97 | 11.30 | | | 22.91 | 9.71 | 23.85 | 9.26 | 26.32 | 7.85 |
| $FeSO_4.Na_2SO_4.4H_2O$ | | | | | | | 16.30 | 14.98 | 16.37 | 15.42 |
| $FeSO_4.Na_2SO_4.4H_2O + Na_2SO_4.10H_2O$ | | | 7.66 | 24.41 | 4.58 | 29.50 | | | | |
| $FeSO_4.Na_2SO_4.4H_2O + Na_2SO_4$ | | | | | | | 4.04 | 30.49 | 4.09 | 30.67 |

Invariant points

| °C | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % $FeSO_4$ | % $Na_2SO_4$ |
| − 3 | $FeSO_4.7H_2O + Na_2SO_4.10H_2O$ + Ice | | |
| − 2 | $FeSO_4.7H_2O$ + Ice | | |
| +18.5 | $FeSO_4.7H_2O + FeSO_4.Na_2SO_4.4H_2O + Na_2SO_4.10H_2O$ | 18.07 | 13.95 |
| 31.4 | $Na_2SO_4.10H_2O + FeSO_4.Na_2SO_4.4H_2O + Na_2SO_4$ | | |

**$SO_4^{--}$ $Fe^{+++}$ (300)**
$H_2O + SO_3 + Fe_2(SO_4)_3$; *v.* Figs. 115 and 116

| Solid phases | Liquid phase | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 50°C | | $t$ = 75°C | | $t$ = 110°C | | $t$ = 140°C; *v.* Fig. 115 | | $t$ = 200°C | |
| | % $Fe_2O_3$ | % $SO_3$ | % $Fe_2O_3$ | % $SO_3$ | % $Fe_2O_3$ | % $SO_3$ | % $Fe_2O_3$ | % $SO_3$ | % $Fe_2O_3$ | % $SO_3$ |
| $Fe_2O_3.H_2O$ | 0.14 | 0.39 | 0.34 | 1.00 | 0.01* | 0.53* | | | | |
| | 0.39 | 0.79 | | | | | | | | |
| | 0.90 | 1.53 | | | | | | | | |
| $Fe_2O_3.H_2O + 3Fe_2O_3.4SO_3.9H_2O$(?) | 1.44 | 2.30 | 0.93 | 1.62 | 0.08† | 0.83† | | | | |
| $Fe_2O_3$ | | | | | | | 0.01 | 0.82 | 0.56 | 4.90 |
| | | | | | | | 0.03 | 1.34 | | |
| | | | | | | | 0.05 | 2.60 | | |
| $Fe_2O_3 + Fe_2O_3.2SO_3.H_2O$ | | | | | | | | | 0.63 | 5.58 |
| $3Fe_2O_3.4SO_3.9H_2O$ | 2.59 | 4.08 | 1.72 | 2.79 | 5.58 | 8.93 | 1.18 | 4.06 | | |
| | 5.71 | 9.09 | 3.40 | 5.24 | | | 1.71 | 5.25 | | |
| | 7.19 | 11.19 | 5.54 | 8.88 | | | 3.51 | 8.25 | | |
| | 15.43 | 20.08 | 9.46 | 14.95 | | | 7.78 | 14.31 | | |
| | 16.09 | 20.81 | 11.23 | 17.73 | | | 9.84 | 17.65 | | |

$SO_4^{--}$ $Fe^{+++}$.—(*Continued*)

| Solid phases | Liquid phase | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 50°C | | $t$ = 75°C | | $t$ = 110°C | | $t$ = 140°C; *v.* Fig. 115 | | $t$ = 200°C | |
| | % $Fe_2O_3$ | % $SO_3$ | % $Fe_2O_3$ | % $SO_3$ | % $Fe_2O_3$ | % $SO_3$ | % $Fe_2O_3$ | % $SO_3$ | % $Fe_2O_3$ | % $SO_3$ |
| $3Fe_2O_3.4SO_3.9H_2O + Fe_2O_3.2SO_3.5H_2O$ | 17.96 | 22.96 | 17.78 | 23.10 | | | | | | |
| $3Fe_2O_3.4SO_3.9H_2O + Fe_2O_3.2SO_3.H_2O$ | | | | | 14.31 | 22.71 | | | | |
| $Fe_2O_3.2SO_3.H_2O$ | | | | | 17.08 | 27.42 | 12.05 | 22.39 | 1.61 | 9.08 |
| | | | | | 19.74 | 30.80 | 15.35 | 30.88 | 1.69 | 11.39 |
| | | | | | 19.04 | 30.97 | | | 3.50 | 19.43 |
| | | | | | | | | | 2.40 | 23.78 |
| | | | | | | | | | 2.59 | 33.14 |
| | | | | | | | | | 2.00 | 41.87 |
| | | | | | | | | | 2.00 | 45.05 |
| | | | | | | | | | 1.91 | 48.94 |
| $Fe_2O_3.2SO_3.5H_2O$ | 20.13 | 27.18 | | | | | | | | |
| $2Fe_2O_3.5SO_3.17H_2O$ | 20.70 | 28.40 | | | | | | | | |
| $2Fe_2O_3.5SO_3.17H_2O + Fe_2O_3.2SO_3.5H_2O$ | | | 20.93 | 30.11 | | | | | | |
| $2Fe_2O_3.5SO_3.17H_2O + Fe_2O_3.3SO_3.7H_2O$ | 16.78 | 30.72 | | | | | | | | |
| $Fe_2O_3.3SO_3.7H_2O$ | 10.26 | 31.91 | | | | | | | | |
| | 8.56 | 32.52 | | | | | | | | |
| $Fe_2O_3.3SO_3.7H_2O + Fe_2O_3.3SO_3.6H_2O$ | | | 18.13 | 32.32 | | | | | | |
| $Fe_2O_3.3SO_3.6H_2O$ | | | | | 10.22 | 32.03 | 3.71 | 37.10 | | |
| | | | | | 3.47 | 35.07 | 1.02 | 47.67 | | |
| | | | | | 1.26 | 41.38 | | | | |
| $Fe_2O_3.3SO_3.6H_2O + Fe_2O_3.4SO_3.9H_2O$ | | | 4.59 | 35.51 | | | | | | |
| $Fe_2O_3.4SO_3.9H_2O$ | 5.55 | 33.96 | 0.71 | 38.68 | 0.81 | 45.45 | | | | |
| | 0.34 | 41.18 | 0.15 | 47.61 | 0.43 | 48.03 | | | | |
| | 0.10 | 48.44 | 0 12 | 54.63 | 0.48 | 53.45 | | | | |
| | 0.09 | 55.34 | | | | | | | | |
| $Fe_2O_3.3SO_3.6H_2O + Fe_2O_3.3SO_3$ | | | | | | | 0.64 | 53.31 | | |
| $Fe_2O_3.3SO_3$ | | | | | | | 0.36 | 58.00 | 1.35 | 52.12 |
| | | | | | | | 0.16 | 61.01 | 0.85 | 53.44 |
| | | | | | | | 0.11 | 65.49 | 0.08 | 68.14 |
| | | | | | | | 0.08 | 74.95 | 0.05 | 73.54 |
| | | | | | | | | | 0.03 | 74.88 |
| | | | | | | | | | 0 04 | 76.17 |
| $Fe_2O_3.4SO_3.3H_2O$ | 0.07 | 59.20 | 0.12 | 56.25 | 0.15 | 59.80 | | | | |
| | 0.08 | 62.34 | 0.07 | 61.73 | 0.13 | 61.96 | | | | |
| | 0.07 | 75.37 | 0.07 | 74.14 | 0.09 | 67.54 | | | | |
| | | | | | 0.06 | 72.50 | | | | |

* Solid phase both crystalline and amorphous. † $Fe_2O_3.H_2O$ crystalline in solid phase.

$SO_4^{--}$ $Fe^{+++}$ [9]: $H_2O + H_2SO_4 + Fe_2O_3$; *v.* Fig. 116

| | Solid phases* | Liquid phase 18°C | | 25°C | |
|---|---|---|---|---|---|
| | | % $Fe_2O_3$ | % $SO_3$ | % $Fe_2O_3$ | % $SO_3$ |
| A | $Fe_2O_3.4SO_3.9H_2O$ | 0.21 | 40.64 | 0.27 | 39.77 |
| | | 0.91 | 36.45 | 0.71 | 37.22 |
| | | 6.48 | 32.43 | 2.38 | 34.99 |
| D | | 8.00 | 31.85 | 3.88 | 33.20 |
| | $Fe_2O_3.4SO_3.9H_4O + Fe_2O_3.3SO_3.7H_2O$ | 9.63 | 31.88 | | |
| | $Fe_2O_3.3SO_3.7H_2O$ | 11.69 | 30.80 | 8.04 | 32.06 |
| | | 13.88 | 29.71 | 10.55 | 30.77 |
| E | | 17.48 | 29.73 | 13.80 | 30.02 |

| | Solid phases* | Liquid phase 18°C | | 25°C | |
|---|---|---|---|---|---|
| | | % $Fe_2O_3$ | % $SO_3$ | % $Fe_2O_3$ | % $SO_3$ |
| F | $7Fe_2O_3.15SO_3$ | | | 17.52 | 29.85 |
| | | | | 18.56 | 29.98 |
| | $Fe_2O_3.3SO_3.7H_2O$ + basic solid solution | 18.68 | 29.64 | | |
| | | 17.96 | 25.42 | 19.98 | 29.19 |
| | | 14.00 | 17.71 | 19.78 | 27.90 |
| | Basic solid soln. | 11.60 | 13.85 | 15.53 | 17.62 |
| | | 6.81 | 7.60 | 13.51 | 14.58 |
| G | | | | 7.91 | 8.19 |

* Cameron and Robinson [65] found $Fe_2O_3.4SO_3.10H_2O$, $Fe_2O_3.3SO_3.10H_2O$ and no definite basic salts. Recoura [306] found two isomeric forms of $Fe_2O_3.3SO_3.9H_2O$ and $7Fe_2O_3.18SO_3.H_2O$. Wirth and Bakker [399] found $Fe_2O_3.4SO_3.9H_2O$, $Fe_2O_3.4SO_3.3H_2O$, $Fe_2O_3.3SO_3.9H_2O$, $Fe_2O_3.5SO_3.18H_2O$, $3Fe_2O_3.8SO_3.27H_2O$, and $Fe_2O_3.0.8SO_3$.

**$SO_4^{--}$ $Fe^{+++}$ $Al^{+++}$: $H_2O + Fe_2(SO_4)_3 + Al_2(SO_4)_3$; $t$ = ? (400)**

| % $Al_2(SO_4)_3$ | % $Fe_2(SO_4)_3$ | % $Al_2(SO_4)_3$ | % $Fe_2(SO_4)_3$ |
|---|---|---|---|
| $Al_2(SO_4)_3$ | | $Al_2(SO_4)_3 + 2Fe_2O_3.5SO_3.18H_2O$ | |
| 27.82 | 0.00 | 10.46 | 31.90 |
| 24.21 | 9.82 | $2Fe_2O_3.5SO_3.18H_2O$ | |
| 21.64 | 13.02 | 8.82 | 34.02 |
| 15.22 | 23.28 | 5.20 | 38.83 |
| | | 0.00 | 44.97 |

**$SO_4^{--}$ $Fe^{+++}$ $Al^{+++}$ $K^+$ (212)**

$H_2O + Fe_2K_2(SO_4)_4 + Al_2K_2(SO_4)_4$; *v.* Fig. 117

The author determined the vapor pressures of ten solid solutions containing, as determined by analysis, from 1.7 to 95.8% of the aluminium-containing component. He calculated the relative proportions of the two components, in the solutions from which these solids separated, from the volumes of saturated solutions of the component salts used in preparing the mixtures. The relation between the composition of the solid and liquid phases was shown by a graph (Fig. 117).

**$SO_4^{--}$ $Fe(CN_6)^{---}$ $Ca^{++}$ $K^+$**

$H_2O + Ca_3(Fe(CN)_6)_2 + K_2SO_4$

$t$ = 25°C (94)

M per 1000M $H_2O$

| $K_2SO_4$ | $CaSO_4$ | $K_3Fe(CN)_6$ |
|---|---|---|
| $CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O$ | | |
| 0.26 | 0.89 | 6.60 |

**$SO_4^{--}$ $Fe(CN)_6^{----}$ $Ca^{++}$ $K^+$**

$H_2O + Ca_2Fe(CN)_6 + K_2SO_4$

$t$ = 25°C (94)

M per 1000M $H_2O$

| $K_2SO_4$ | $CaSO_4$ | $K_4Fe(CN)_6$ |
|---|---|---|
| $K_2CaFe(CN)_6 + CaSO_4.2H_2O + CaSO_4.K_2SO_4.H_2O$ | | |
| 3.07 | 0.28 | 0.33 |

**$SO_4^{--}$ $Ni^{++}$ $K^+$**

$H_2O + NiSO_4 + K_2SO_4$

$t$ = 25°C (72.5)

| % $NiSO_4$ | % $K_2SO_4$ |
|---|---|
| $K_2SO_4$ | |
| 0 | 10.59 |
| $K_2SO_4 + K_2SO_4.NiSO_4.6H_2O$ | |
| 0.33 | 11.16 |
| $K_2SO_4.NiSO_4.6H_2O$ | |
| 1.35 | 4.93 |
| 3.90 | 4.15 |
| 10.15 | 4.11 |
| 15.66 | 4.75 |
| 19.33 | 5.62 |
| 23.09 | 6.82 |
| $K_2SO_4.NiSO_4.6H_2O + NiSO_4.7H_2O$ | |
| 27.90 | 8.26 |
| $NiSO_4.7H_2O$ | |
| 27.92 | 6.30 |
| 27.87 | 3.82 |
| 27.94 | 0 |

**$SO_4^{--}$ $Co^{++}$ $Na^+$ (233)**

$H_2O + CoSO_4 + Na_2SO_4$

| Solid phases | Liquid phase | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 5°C | | $t$ = 10°C | | $t$ = 20°C | | $t$ = 25°C | | $t$ = 30°C | | $t$ = 35°C | | $t$ = 40°C | |
| | % $CoSO_4$ | % $Na_2SO_4$ | % $CoSO_4$ | % $Na_2SO_4$ | % $CoSO_4$ | % $Na_2SO_4$ | % $CoSO_4$ | % $Na_2SO_4$ | % $CoSO_4$ | % $Na_2SO_4$ | % $CoSO_4$ | % $Na_2SO_4$ | % $CoSO_4$ | % $Na_2SO_4$ | % $CoSO_4$ | % $Na_2SO_4$ |
| $CoSO_4.7H_2O$ | 20.32 | | 21.90 | | 23.40 | | 26.59 | | 28.22 | | 29.70 | | 31.40 | | 32.82 | |
| $CoSO_4.7H_2O + Na_2SO_4.10H_2O$ | 16.57 | 7.64 | 17.47 | 9.60 | 17.90 | 11.73 | | | | | | | | | | |
| $CoSO_4.7H_2O + CoSO_4.Na_2SO_4.4H_2O$ | | | 18.75* | 15.61* | | | 19.30 | 15.10 | 20.31 | 13.60 | 21.67 | 12.05 | 22.76 | 10.43 | 24.05 | 9.16 |
| $CoSO_4.Na_2SO_4.4H_2O$ | | | | | | | 17.58 | 16.43 | 17.06 | 15.70 | 15.98 | 14.93 | 15.72 | 14.54 | 14.88 | 14.22 |
| $CoSO_4.Na_2SO_4.4H_2O + Na_2SO_4.10H_2O$ | | | | | | | 15.41 | 18.12 | 10.63 | 23.26 | 6.01 | 28.67 | | | | |
| $CoSO_4.Na_2SO_4.4H_2O + Na_2SO_4$ | | | | | | | | | | | | | 4.56 | 32.15 | 4.73 | 31.78 |

Invariant points

| °C | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % $CoSO_4$ | % $Na_2SO_4$ |
| − 4.5 | $CoSO_4.7H_2O + Na_2SO_4.10H_2O$ + Ice | | |
| − 3 | $CoSO_4.7H_2O$ + Ice | | |
| +17.5 | $CoSO_4.7H_2O + CoSO_4.Na_2SO_4.4H_2O + Na_2SO_4.10H_2O$ | 18.57 | 16.09 |
| 31.5 | $Na_2SO_4.10H_2O + CoSO_4.Na_2SO_4.4H_2O + Na_2SO_4$ | | |
| 40.7 | $CoSO_4.7H_2O + CoSO_4.6H_2O$ | | |

* $t$ = 18.50°C.

**$SO_4^{--}$ $Ni^{++}$ $Na^+$ (233)**

$H_2O + NiSO_4 + Na_2SO_4$

| Solid phases | Liquid phase—largely mean of two or more results | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 5°C | | $t$ = 10°C | | $t$ = 18.5°C | | $t$ = 20°C | | $t$ = 25°C | | $t$ = 30°C | | $t$ = 35°C | | $t$ = 40°C | |
| | % $NiSO_4$ | % $Na_2SO_4$ | % $NiSO_4$ | % $Na_2SO_4$ | % $NiSO_4$ | % $Na_2SO_4$ | % $NiSO_4$ | % $Na_2SO_4$ | % $NiSO_4$ | % $Na_2SO_4$ | % $NiSO_4$ | % $Na_2SO_4$ | % $NiSO_4$ | % $Na_2SO_4$ | % $NiSO_4$ | % $Na_2SO_4$ | % $NiSO_4$ | % $Na_2SO_4$ |
| $NiSO_4.7H_2O$ | 21.39 | 0 | | | | | | | | | | | | | | | | |
| $NiSO_4.7H_2O + Na_2SO_4.10H_2O$ | 16.94 | 7.61 | 17.99 | 10.85 | 18.97 | 13.86 | | | | | | | | | | | | |
| $NiSO_4.7H_2O + NiSO_4.Na_2SO_4.4H_2O$ | | | | | | | 19.62 | 16.49 | 20.13 | 16.16 | 21.20 | 14.77 | 22.60 | 12.80 | 23.62 | 10.78 | 24.92 | 9.39 |
| $NiSO_4.Na_2SO_4.4H_2O$ | | | | | | | | | 18.76 | 17.21 | 17.85 | 16.54 | 16.74 | 15.34 | 16.28 | 14.91 | 15.35 | 14.49 |
| $NiSO_4.Na_2SO_4.4H_2O + Na_2SO_4.10H_2O$ | | | | | | | 16.80 | 18.93 | 15.49 | 20.18 | 10.92 | 24.12 | 6.40 | 28.71 | | | | |
| $NiSO_4.Na_2SO_4.4H_2O + Na_2SO_4$ | | | | | | | | | | | | | | | 4.55 | 31.66 | 4.64 | 31.38 |

$SO_4^{--}$ $Ni^{++}$ $Na^+$.—(*Continued*)

Invariant points

| °C | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % $NiSO_4$ | % $Na_2SO_4$ |
| − 5.1 | $NiSO_4.7H_2O$ + $Na_2SO_4.10H_2O$ + Ice | | |
| − 4 | $NiSO_4.7H_2O$ + Ice | | |
| +16.5 | $NiSO_4.7H_2O$ + $NiSO_4.Na_2SO_4.4H_2O$ + $Na_2SO_4.10H_2O$ | 19.06 | 17.52 |
| 31.5 | $NiSO_4.7H_2O$ + $NiSO_4.6H_2O$ | | |
| 31.8 | $Na_2SO_4.10H_2O$ + $NiSO_4.Na_2SO_4.4H_2O$ + $Na_2SO_4$ | | |

$SO_4^{--}$ $B_4O_7^{--}$ $Na^+$ (327)

$H_2O$ + $Na_2SO_4$ + $Na_2B_4O_7$; *v.* Fig. 123

| Solid phases | Liquid phase—% A = % $Na_2B_4O_7$; % B = % $Na_2SO_4$ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 10°C | | $t$ = 20°C | | $t$ = 25°C | | $t$ = 30°C | | $t$ = 35°C | |
| | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B |
| $Na_2B_4O_7.10H_2O$ | 1.60 | | 2.52 | | 3.09 | | 3.75 | | 4.83* | |
| | 1.09 | 1.83 | 1.11 | 9.24 | 2.06 | 3.22 | | | 3.41* | 3.67* |
| | 0.81* | 4.38* | | | 1.31 | 12.66 | | | 1.73 | 26.95 |
| | | | | | 1.23 | 16.76 | | | 1.60 | 31.64 |
| $Na_2B_4O_7.10H_2O$ + $Na_2SO_4.10H_2O$ | 0.70* | 8.36* | 1.00* | 16.11* | 1.13 | 21.93 | 1.27* | 28.78* | | |
| $Na_2B_4O_7.10H_2O$ + $Na_2SO_4$ | | | | | | | | | 1.58* | 32.25* |
| $Na_2SO_4.10H_2O$ | | 8.43 | | 16.22 | 0.33 | 21.91 | | 28.60 | | |
| | | | | | | 21.90 | | | | |
| $Na_2SO_4$ | | | | | | | | | 1.26 | 32.60 |
| | | | | | | | | | 0.55 | 32.91 |
| | | | | | | | | | | 33.07 |

| Solid phases | Liquid phase—% A = % $Na_2B_4O_7$; % B = % $Na_2SO_4$ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 45°C | | $t$ = 50°C | | $t$ = 55°C | | $t$ = 65°C | | $t$ = 80°C | |
| | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B |
| $Na_2B_4O_7.10H_2O$ | 7.49* | | 9.52 | | 12.37 | | 17.95 | | | |
| | 4.11 | 13.99 | 6.94 | 7.98 | 8.47 | 13.05 | 10.46 | 17.08 | | |
| | | | 4.76 | 25.48 | | | | | | |
| $Na_2B_4O_7.10H_2O$ + $Na_2SO_4$ | 3.13* | 30.15 | | | | | | | | |
| $Na_2B_4O_7.10H_2O$ + $Na_2B_4O_7.5H_2O$ | | | | | 8.06* | 16.97* | | | | |
| $Na_2B_4O_7.5H_2O$ | | | | | 7.58 | 18.31 | | | 23.90 | |
| $Na_2B_4O_7.5H_2O$ + $NaSO_4$ | | | | | 6.49 | 26.26 | | | | |
| | | | 4.62* | 29.00* | 5.99* | 28.08* | 7.91* | 26.47* | 14.57 | 22.38 |
| $Na_2SO_4$ | 1.15 | 31.27 | | | | | | | | |
| | 0.60 | 31.65 | | | | | | | | |
| | | 32.24 | 1.87 | 30.62 | | 31.58 | | 31.05 | | 30.41 |
| | | | | 31.90 | | | | | | |

Invariant points

| °C | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % $Na_2B_4O_7$ | % $Na_2SO_4$ |
| − 0.45 | $Na_2B_4O_7.10H_2O$ + Ice | 1.09 | |
| − 1.38 | $Na_2B_4O_7.10H_2O$ + $Na_2SO_4.10H_2O$ + Ice | 0.63* | 3.83* |
| − 1.02 | $Na_2SO_4.10H_2O$ | | 3.85 |
| +31.9 | $Na_2SO_4.10H_2O$ + $Na_2SO_4$ + $Na_2B_4O_7.10H_2O$ | 1.41* | 32.38* |
| 49.3 | $Na_2B_4O_7.10H_2O$ + $Na_2B_4O_7.5H_2O$ + $Na_2SO_4$ | 4.58 | 29.25 |
| 102.2† | $Na_2SO_4$ | | 29.72* |
| 102.9† | $Na_2B_4O_7.5H_2O$ | 37.08* | |
| 104† | $Na_2B_4O_7.5H_2O$ + $Na_2SO_4$ | 28.15* | 15.89 |

* Mean of more than one determination.

† Boiling point.

### $SO_4^{--}$ $Cr^{+++}$ $Al^{+++}$ $K^+$ (212)

$H_2O + Cr_2K_2(SO_4)_4 + Al_2K_2(SO_4)_4$; *v.* Fig. 118

The author determined the vapor pressures of eleven solid solutions containing, as determined by analysis, from 4.5 to 97.6% of the aluminium-containing component. He calculated the relative proportions of the two components in the solutions from which the solids separated from the volumes of saturated solutions of the component salts used in preparing the mixtures. The relation between the composition of the solid and liquid phases was shown by means of a graph (Fig. 118).

### $SO_4^{--}$ $CrO_4^{--}$

$H_2O + H_2SO_4 + H_2CrO_4$; *v.* Fig. 119; $t$ = 25°C (146)

| | Solid phases | Liquid phase % $CrO_3$ | Liquid phase % $SO_3$ |
|---|---|---|---|
| A | | 65.86 | 0 |
| | | 50.65 | 7.78 |
| | | 31.68 | 19.63 |
| B | $CrO_3$ | 11.82 | 35.28 |
| C | | 0.44 | 55.62 |
| | | 0.87 | 62.45 |
| | | 3.44 | 65.51 |
| | | 4.09 | 65.99 |
| D | | 3.96 | 66.57 |
| | | 1.97 | 69.76 |
| | $CrO_3.SO_3$ | 2.60 | 72.24 |
| | | 0.85 | 73.62 |
| E | | 0.94 | 78.35 |
| | $CrO_3.SO_3.H_2O$ | 0.42 | 79.94 |
| F | | 1.59 | 85.32 |

$t$ = 23°C (264)

| % $H_2SO_4$ | % $CrO_3$ | % $H_2SO_4$ | % $CrO_3$ |
|---|---|---|---|
| | $CrO_3$ | | |
| 14.43 | 29.25 | 84.04 | 1.24 |
| 33.96 | 14.23 | 92.40 | 0.11 |
| 60.07 | 1.01 | 97.20 | 0.42 |
| 79.03 | 0.79 | 99.40 | 0.16 |

### $SO_4^{--}$ $CrO_4^{--}$ $Na^+$ (377)

$H_2O + Na_2SO_4 + Na_2CrO_4$; *v.* Fig. 120

| | Solid phases | Liquid phase, $t$ = 15°C % $Na_2CrO_4$ | Liquid phase, $t$ = 15°C % $Na_2SO_4$ | Liquid phase, $t$ = 25°C % $Na_2CrO_4$ | Liquid phase, $t$ = 25°C % $Na_2SO_4$ |
|---|---|---|---|---|---|
| A | | 0.0 | 11.70 | 0.0 | 21.90 |
| | | 3.92 | 10.08 | 2.53 | 20.12 |
| | | 8.91 | 8.35 | 4.95 | 18.62 |
| | | 14.90 | 6.41 | 9.66 | 16.49 |
| | Solid soln. I* | 20.03 | 5.05 | 14.85 | 13.87 |
| | | 28.49 | 3.18 | 23.73 | 10.69 |
| | | 36.44 | 0.47 | | |
| | | 37.45 | 0.0 | | |
| B | Solid soln. I + $Na_2SO_4$ | | | 31.70 | 8.45 |
| | | | | 32.34 | 8.03 |
| | $Na_2SO_4$ | | | 38.59 | 4.44 |
| C | $Na_2SO_4 + Na_2CrO_4.6H_2O$ | | | 42.48 | 2.79 |
| D | $Na_2CrO_4.6H_2O$ | | | 45.76 | 0.0 |

* Solid soln. I. Between 0 and 19.52°C, $Na_2SO_4.10H_2O$ and $Na_2CrO_4.10H_2O$ form a continuous series of solid solutions. Between 19.52 and 32.38°C the sulfate dissolves some chromate but the chromate does not dissolve sulfate (289).

Transition temperatures (308)

$Na_2CrO_4.10H_2O \leftrightarrow Na_2CrO_4.6H_2O$ at 19.52°C.
$Na_2CrO_4.6H_2O \leftrightarrow Na_2CrO_4.4H_2O$ at 26.6°C.
$Na_2CrO_4.4H_2O \leftrightarrow Na_2CrO_4$ at 62.8°C.
$Na_2SO_4.10H_2O \leftrightarrow Na_2SO_4$ at 32.383°C.

### $SO_4^{--}$ $CrO_4^{--}$ $Na^+$.—(*Continued*)

| Solid phases (292) | Liquid phase (292) $t$ = 28°C % $Na_2CrO_4$ | $t$ = 28°C % $Na_2SO_4$ | $t$ = 31°C % $Na_2CrO_4$ | $t$ = 31°C % $Na_2SO_4$ | $t$ = 33°C % $Na_2CrO_4$ | $t$ = 33°C % $Na_2SO_4$ |
|---|---|---|---|---|---|---|
| $Na_2SO_4.10H_2O$ | 0.0 | 26.31 | 0.0 | 30.61 | | |
| | 2.49 | 24.61 | 1.35 | 29.82 | | |
| | 8.46 | 20.91 | 3.05 | 28.93 | | |
| Solid soln.A * | 11.32 | 19.79 | 3.78 | 28.59 | | |
| | 14.18 | 18.25 | 5.05 | 27.94 | | |
| | 17.28 | 16.49 | 6.38 | 27.07 | | |
| Solid soln. A + $Na_2SO_4$ | 21.39† | 15.18† | 6.52 | 27.05 | | |
| | 24.54 | 12.61 | 8.05 | 26.05 | 0.0 | 33.27 |
| | 27.64 | 10.39 | 10.95 | 23.29 | 4.08 | 29.85 |
| | 32.29 | 7.35 | 14.12 | 20.20 | 7.03 | 26.89 |
| $Na_2SO_4$ | 40.61 | 3.37 | 19.43 | 16.33 | 11.11 | 23.39 |
| | | | 30.89 | 8.13 | 19.73 | 16.27 |
| | | | 37.95 | 4.43 | 25.19 | 12.61 |
| | | | | | 35.25 | 6.16 |
| $Na_2SO_4 + Na_2CrO_4.4H_2O$ | 44.14† | 2.20† | 45.75 | 1.88 | 45.27 | 1.49 |
| $Na_2CrO_4.4H_2O$ | 46.07 | 0.74 | | | | |
| | 46.13 | 0.0 | 46.78 | 0.0 | 46.75 | 0.0 |

* Solid soln. A = $Na_2SO_4.10H_2O + Na_2CrO_4.10H_2O$. † Mean values.

### $SO_4^{--}$ $CrO_4^{--}$ $K^+$

$H_2O + K_2SO_4 + K_2CrO_4$; *v.* Fig. 121; $t$ = 25°C (2)

| Solid phases | Liquid phase—g per 100g $H_2O$ % $K_2CrO_4$ | $K_2SO_4$ | $K_2CrO_4$ |
|---|---|---|---|
| $K_2SO_4$ | | 12.10 | 0.0 |
| | 0.33 | 10.86 | 1.94 |
| | 0.66 | 10.25 | 4.36 |
| | 1.47 | 8.98 | 7.81 |
| | 2.55 | 7.12 | 14.65 |
| | 4.04 | 5.72 | 20.83 |
| Solid soln | 6.28 | 4.82 | 27.36 |
| | 11.98 | 3.33 | 40.93 |
| | 21.89 | 2.36 | 51.81 |
| | 38.69 | 1.84 | 58.40 |
| | 62.28 | 1.17 | 61.39 |
| | 82.84 | 0.76 | 63.09 |
| $K_2CrO_4$ | | 0.0 | 64.62 |

### $SO_4^{--}$ $MoO_4^{--}$ $K^+$

$H_2O + K_2SO_4 + K_2MoO_4$; $t$ = 25°C (2)

| Solid phases | Liquid phase—g per 100g $H_2O$ % $K_2MoO_4$ | $K_2SO_4$ | $K_2MoO_4$ |
|---|---|---|---|
| $K_2SO_4$ | | 12.10 | 0.0 |
| | 0.25 | 8.55 | 4.73 |
| | 0.42 | 3.95 | 17.48 |
| | 0.82 | 2.13 | 45.89 |
| | 1.02 | 1.50 | 99.49 |
| Solid soln | 1.45 | 1.27 | 107.5 |
| | 1.67 | 0.98 | 127.2 |
| | 5.25 | 0.72 | 177.0 |
| | 17.24 | 0.46 | 180.7 |
| $K_2MoO_4$ | | 0.0 | 184.6 |

### $SO_4^{--}$ $B_4O_7^{--}$ $Na^+$; *v.* p. 346

### $SO_4^{--}$ $Al^{+++}$: $H_2O + H_2SO_4 + Al_2(SO_4)_3$; $t$ = 25°C (396)

| M ½ $H_2SO_4$/l | g $Al_2(SO_4)_3$ per g soln. | M ½ $H_2SO_4$/l | g $Al_2(SO_4)_3$ per g soln. |
|---|---|---|---|
| | ?* | | |
| 0.0 | 27.82 | 10.89 | 5.07 |
| 1.1 | 29.21 | 15.15 | 1.216 |
| 2.16 | 26.21 | 20.10 | 1.243 |
| 4.32 | 20.44 | 24.92 | 2.915 |
| 6.17 | 15.40 | | |

* Excess of $Al_2(SO_4)_3.18H_2O$ used.

**$SO_4^{--}$ $Al^{+++}$ $K^+$**

$H_2O + Al_2(SO_4)_3 + K_2SO_4$

$t = 25°C$ (42)

| % $Al_2(SO_4)_3$ | % $K_2SO_4$ |
|---|---|
| $Al_2(SO_4)_3.18H_2O$ | |
| 27.70 | 0 |
| 28.00 | 0.98 |
| $Al_2(SO_4)_3.18H_2O + Al_2(SO_4)_3.K_2SO_4.24H_2O$ | |
| 30.22 | 1.93 |
| $Al_2(SO_4)_3.K_2SO_4.24H_2O$ | |
| 27.91 | 1.94 |
| 14.98 | 1.46 |
| 11.29 | 1.45 |
| 8.43 | 1.71 |
| 6.14 | 1.86 |
| 4.49 | 2.27 |
| 3.06 | 3.54 |
| 1.85 | 7.24 |
| 1.46 | 10.57 |
| $Al_2(SO_4)_3.K_2SO_4.24H_2O + K_2SO_4$ | |
| 1.33 | 11.50 |
| $K_2SO_4$ | |
| 0.75 | 10.69 |
| 0 | 10.75 |

**$SO_4^{--}$ $Sc^{+++}$**

$H_2O + H_2SO_4 + Sc_2(SO_4)_3$

$t = 25°C$ (398)

| M ½$H_2SO_4$/l | g $Sc_2O_3$/100g of liquid |
|---|---|
| $Sc_2(SO_4)_3.5H_2O$ | |
| 0 | 10.32 |
| 0.5 | 10.60 |
| 1.0 | 7.192 |
| 4.86 | 3.026 |
| 9.73 | 0.476 |
| $Sc_2(SO_4)_3.3H_2SO_4$ | |
| 22.35 | 0.175 |

**$SO_4^{--}$ $Y^{+++}$ $Na^+$**

$H_2O + Y_2(SO_4)_3 + Na_2SO_4$

$t = 25°C$ (221)

| % $Na_2SO_4$ | % $Y_2(SO_4)_3$ |
|---|---|
| $Y_2(SO_4)_3.?H_2O$ | |
| 1.21 | 5.25 |
| 3.50 | 5.79 |
| 5.47 | 6.52 |
| $Y_2(SO_4)_3.?H_2O + Na_2SO_4.Y_2(SO_4)_3.2H_2O$ | |
| 7.29 | 7.21 |
| $Na_2SO_4.Y_2(SO_4)_3.2H_2O$ | |
| 6.67 | 5.16 |
| 8.93 | 3.01 |
| 9.99 | 2.07 |
| 11.62 | 1.75 |
| 13.96 | 1.51 |
| 15.33 | 1.54 |
| 16.96 | 2.45 |
| 21.75 | 1.17 |

**$SO_4^{--}$ $La^{+++}$**

$H_2O + H_2SO_4 + La_2(SO_4)_3$

$t = 25°C$ (395)

| M ½$H_2SO_4$/l | % $La_2(SO_4)_3$ |
|---|---|
| $La_2(SO_4)_3.9H_2O$ | |
| 0.0 | 2.483 |
| 0.505 | 2.934 |
| 1.10 | 3.118 |
| 2.16 | 3.156 |
| 3.39 | 2.465 |
| 4.321 | 1.927 |
| 6.685 | 0.9217 |
| 9.68 | 0.4617 |
| 12.60 | 0.3709 |
| 15.15 | 0.3073 |

**$SO_4^{--}$ $La^{+++}$ $Na^+$**

$H_2O + La_2(SO_4)_3 + Na_2SO_4$

$t = 18°C$ (22)

g per 100g $H_2O$

| $La_2(SO_4)_3$ | $Na_2SO_4$ |
|---|---|
| $La_2(SO_4)_3.?H_2O$ | |
| 2.130 | 0.0 |
| 0.997 | 0.395 |
| 0.353 | 0.689 |
| 0.129 | 1.136 |
| 0.044 | 2.480 |
| 0.016 | 5.548 |

**$SO_4^{--}$ $La^{+++}$ $K^+$**

$H_2O + La_2(SO_4)_3 + K_2SO_4$

$t = 16.5°C$ (22)

g per 100g $H_2O$

| $La_2(SO_4)_3$ | $K_2SO_4$ |
|---|---|
| $La_2(SO_4)_3.?H_2O$ | |
| 2.208 | 0.0 |
| 0.727 | 0.247 |
| 0.269 | 0.496 |
| 0.185 | 0.846 |
| 0.054 | 1.029 |
| 0.022 | 1.156 |

**$SO_4^{--}$ $Ce^{+++}$**

$H_2O + H_2SO_4 + Ce_2(SO_4)_3$

$t = 25°C$ (395)

| M ½$H_2SO_4$/l | %$Ce_2(SO_4)_3$ |
|---|---|
| $Ce_2(SO_4)_3.8H_2O$ | |
| 0.0 | 7.60 |
| 0.1 | 7.618 |
| 1.1 | 6.00 |
| 2.16 | 5.018 |
| 4.32 | 3.301 |
| 6.685 | 1.505 |
| 9.68 | 0.733 |
| 15.15 | 0.239 |

**$SO_4^{--}$ $Ce^{+++}$ $Na^+$**

$H_2O + Ce_2(SO_4)_3 + Na_2SO_4$

$t = 19°C$ (22)

g per 100g $H_2O$

| $Ce_2(SO_4)_3$ | $Na_2SO_4$ |
|---|---|
| $Ce_2(SO_4)_3.?H_2O$ | |
| 9.648 | 0.0 |
| 0.637 | 0.328 |
| 0.259 | 0.684 |
| 0.0937 | 1.091 |
| 0.0303 | 1.699 |
| 0.012 | 2.640 |
| 0.0037 | 7.710 |

**$SO_4^{--}$ $Ce^{+++}$ $K^+$**

$H_2O + Ce_2(SO_4)_3 + K_2SO_4$

$t = 16°C$ (22, 401.2)

g per 100g $H_2O$

| $Ce_2(SO_4)_3$ | $K_2SO_4$ |
|---|---|
| $Ce_2(SO_4)_3.?H_2O$ | |
| 10.474 | 0.0 |
| 0.956 | 0.178 |
| 0.432 | 0.510 |
| 0.250 | 0.726 |
| 0.0419 | 1.290 |

**$SO_4^{--}$ $Ce^{++++}$**

$H_2O + H_2SO_4 + CeO_2$

$t = 25°C$ (365)

| g $CeO_2$/l | g $SO_3$/l |
|---|---|
| $CeO_2.SO_3.2H_2O$* | |
| 6.303 | 20.496 |
| 3.693 | 13.8424 |
| 2.245 | 9.3328 |
| 1.4365 | 6.3792 |
| 0.7395 | 2.4879 |
| 0.3560 | 0.9988 |
| 0.2366 | 0.4775 |
| 0.1100 | 0.2053 |

* This yellow basic salt was tested for cerous salt with negative result.

**$SO_4^{--}$ $Sm^{+++}$**

$H_2O + H_2SO_4 + Sm_2(SO_4)_3$

$t = 25°C$ (395)

| M ½$H_2SO_4$/l | % $Sm_2(SO_4)_3$ |
|---|---|
| $Sm_2(SO_4)_3.8H_2O$ | |
| 0.0 | 3.426 |
| 0.1 | 3.441 |
| 0.505 | 3.352 |
| 1.1 | 3.075 |
| 2.16 | 2.416 |
| 6.175 | 0.7025 |
| 12.60 | 0.1107 |

**$SO_4^{--}$ $Gd^{+++}$**

$H_2O + H_2SO_4 + Gd_2(SO_4)_3$

$t = 25°C$ (395)

| M ½$H_2SO_4$/l | % $Gd_2(SO_4)_3$ |
|---|---|
| $Gd_2(SO_4)_3$ | |
| 0.0 | 2.981 |
| 0.1 | 3.291 |
| 0.505 | 3.931 |
| 1.1 | 3.807 |
| 2.16 | 2.974 |
| 6.175 | 0.8777 |
| 12.60 | 0.0867 |

**$SO_4^{--}$ $Er^{+++}$**

$H_2O + H_2SO_4 + Er_2(SO_4)_3$

$t = 25°C$ (395)

| M ½$H_2SO_4$/l | % $Er_2(SO_4)_3$ |
|---|---|
| $Er_2(SO_4)_3.8H_2O$ | |
| 0.0 | 11.94 |
| 0.1 | 12.02 |
| 0.505 | 10.164 |
| 1.10 | 8.549 |
| 2.16 | 6.473 |
| 6.175 | 1.521 |
| 12.60 | 0.1386 |

**$SO_4^{--}$ $Be^{++}$ (= $Gl^{++}$)**

$H_2O + H_2SO_4 + BeSO_4$

$t = 25°C$ (41)

| % $BeSO_4$ | % $H_2SO_4$ |
|---|---|
| $BeSO_4.4H_2O$* | |
| 29.94 | 0 |
| 20.51 | 12.91 |
| 15.91 | 19.17 |
| 13.65 | 22.36 |
| 8.61 | 32.04 |
| 5.25 | 40.34 |
| 3.54 | 46.59 |
| 2.04 | 55.50 |
| 0.98 | 62.02 |
| 0.89 | 66.07 |
| 0.86 | 66.10 |

$t = 25°C$ (396)

| M ½$H_2SO_4$/l† | % $BeSO_4$ |
|---|---|
| $BeSO_4.6H_2O$ | |
| 0.0 | 8.212 |
| 1.1 | 8.429 |
| 2.11 | 7.944 |
| 4.32 | 6.603 |
| 8.70 | 5.631 |
| 10.80 | 5.773 |
| 12.60 | 6.628 |
| $BeSO_4.4H_2O$ | |
| 14.50 | 5.438 |
| 16.96 | 3.640 |
| 19.84 | 2.244 |
| 20.78 | 2.128 |
| 24.92 | 2.185 |

* The author states that he could not get any evidence for $BeSO_4.6H_2O$ as given by Wirth (396) and that his values for solubility of $BeSO_4.4H_2O$ were considerably less than those of Wirth.

† Plus an excess of $BeSO_4.6H_2O$.

**$SO_4^{--}$ $Be^{++}$ (= $Gl^{++}$)**

$H_2O + BeO + BeSO_4$

$t = 25°C$ (361.5)

Gives data for solubility of $BeSO_4.4H_2O$ in solutions containing varying concentrations of BeO.

**$SO_4^{--}$ $Gl^{++}$ (= $Be^{++}$) $K^+$: $H_2O + GlSO_4 + K_2SO_4$; $t = 25°C$ (45);** *v.* Fig. 124

| | Solid phases | Liquid phase: % $K_2SO_4$ | Liquid phase: % $GlSO_4$ |
|---|---|---|---|
| A | $K_2SO_4$ | 10.75 | 0.0 |
| | | 12.31 | 3.08 |
| | | 13.38 | 5.20 |
| | | 16.51 | 8.93 |

$SO_4^{--}$ $Gl^{++}$ (= $Be^{++}$) $K^+$.—(*Continued*)

| | Solid phases | Liquid phase % $K_2SO_4$ | Liquid phase % $GlSO_4$ |
|---|---|---|---|
| B | $K_2SO_4$ and $K_2SO_4.GlSO_4.2H_2O$ | 18.42 | 10.91 |
| | | 17.75 | 10.74 |
| | | 16.79 | 10.69 |
| | | 15.77 | 10.34 |
| | $K_2SO_4.GlSO_4.2H_2O$ | 11.69 | 8.93 |
| | | 10.60 | 9.40 |
| C | | 7.74 | 11.10 |
| | | 6.14 | 13.78 |
| | | 4.64 | 24.01 |
| D | $K_2SO_4.GlSO_4.2H_2O$ + $GlSO_4.4H_2O$ | 4.78 | 26.66 |
| | | 3.06 | 28.20 |
| | $GlSO_4.4H_2O$ | 1.97 | 28.33 |
| E | | 0.0 | 29.94 |

$SO_4^{--}$ $Mg^{++}$ $Ca^{++}$: $H_2O$ + $MgSO_4$ + $CaSO_4$

| % $CaSO_4$ | % $MgSO_4$ | % $CaSO_4$ | % $MgSO_4$ |
|---|---|---|---|
| $t$ = 25°C (55) | | $CaSO_4.2H_2O$ | |
| $CaSO_4.2H_2O$ | | 0.120 | 16.829 |
| 0.204 | 0 | 0.1036 | 19.190 |
| 0.161 | 0.318 | 0.086 | 21.450 |
| 0.149 | 0.633 | 0.068 | 23.606 |
| 0.145 | 1.052 | 0.050 | 25.673 |
| 0.144 | 2.089 | $CaSO_4.2H_2O$ + $MgSO_4.7H_2O$ | |
| 0.149 | 4.096 | 0.038 | 27.254 |
| 0.151 | 6.036 | $t$ = 25°C (162) | |
| 0.149 | 7.908 | $CaSO_4.2H_2O$ | |
| 0.145 | 11.463 | 0.20854 | 0.0 |
| 0.140 | 13.155 | 0.19565 | 0.06029 |
| 0.135 | 14.435 | 0.1848 | 0.12167 |
| 0.128 | 14.839 | 0.1777 | 0.18339 |

$SO_4^{--}$ $Mg^{++}$ $Ca^{++}$ $K^+$

$H_2O$ + $MgSO_4$ + $CaSO_4$ + $K_2SO_4$ (187, 231); *v.* Figs. 125, 126

| | Solid phases | Liquid phase % $CaSO_4$ | Liquid phase % $MgSO_4$ | Liquid phase % $K_2SO_4$ |
|---|---|---|---|---|
| | $t$ = 25°C; *v.* Fig. 125 | | | |
| A | $MgSO_4.7H_2O$ + $CaSO_4.2H_2O$ | ? | 26.82 | |
| B | $MgSO_4.7H_2O$ | | 26.76 | |
| C | $K_2SO_4$ + $CaSO_4.K_2SO_4.H_2O$ | ? | | 10.40 |
| D | $K_2SO_4$ | | | 10.77 |
| E | $CaSO_4.2H_2O$ + $CaSO_4.K_2SO_4.H_2O$ | 0.18 | | 3.09 |
| F | $MgSO_4.7H_2O$ + $MgSO_4.K_2SO_4.6H_2O$ | | 26.39 | 4.02 |
| G | $K_2SO_4$ + $MgSO_4.K_2SO_4.6H_2O$ | | 12.68 | 10.70 |
| P | $K_2SO_4$ + $MgSO_4.K_2SO_4.6H_2O$ + $CaSO_4.K_2SO_4.H_2O$ | ? | 11.35 | 11.89 |
| | $MgSO_4.7H_2O$ + $MgSO_4.K_2SO_4.6H_2O$ + $CaSO_4.K_2SO_4.H_2O$ | ? | 27.05 | 3.56 |
| R | $CaSO_4.2H_2O$ + $CaSO_4.K_2SO_4.H_2O$ + $2CaSO_4.MgSO_4.K_2SO_4.2H_2O$ | ? | 26.36 | 2.39 |
| | $MgSO_4.7H_2O$ + $CaSO_4.K_2SO_4.H_2O$ + $2CaSO_4.MgSO_4.K_2SO_4.2H_2O$ | ? | 27.02 | 3.43 |
| | $MgSO_4.7H_2O$ + $CaSO_4.2H_2O$ + $2CaSO_4.MgSO_4.K_2SO_4.2H_2O$ | ? | 26.47 | 2.48 |
| | $t$ = 83°C; *v.* Fig. 126 | | | |
| A | $MgSO_4.H_2O$ + $CaSO_4$ | | 40.20 | |
| B | $MgSO_4.H_2O$ | | 40.20 | |
| C | $2MgSO_4.K_2SO_4$ + $MgSO_4.H_2O$ | | 37.04 | 1.78 |
| D | $K_2SO_4$ + $MgSO_4.K_2SO_4.4H_2O$ | | 18.56 | 16.12 |
| E | $K_2SO_4$ + $CaSO_4.K_2SO_4.H_2O$ | ? | | 17.88 |
| F | $CaSO_4.K_2SO_4.H_2O$ + $5CaSO_4.K_2SO_4.H_2O$ | ? | | 8.82 |
| G | $CaSO_4$ + $5CaSO_4.K_2SO_4.H_2O$ | ? | | 1.19 |
| P | $5CaSO_4.K_2SO_4.H_2O$ + $CaSO_4$ + $4CaSO_4.MgSO_4.K_2SO_4.2H_2O$ | ? | 4.03 | 3.15 |
| Q | $5CaSO_4.K_2SO_4.H_2O$ + $2CaSO_4.MgSO_4.K_2SO_4.2H_2O$ + $4CaSO_4.MgSO_4.K_2SO_4.2H_2O$ | ? | 5.12 | 4.80 |
| R | $CaSO_4.K_2SO_4.H_2O$ + $5CaSO_4.K_2SO_4.H_2O$ + $2CaSO_4.MgSO_4.K_2SO_4.2H_2O$ | ? | 2.68 | 8.00 |
| S | $K_2SO_4$ + $CaSO_4.K_2SO_4.H_2O$ + $2CaSO_4.MgSO_4.K_2SO_4.2H_2O$ | ? | 15.48 | 15.39 |
| T | $K_2SO_4$ + $MgSO_4.K_2SO_4.4H_2O$ + $2CaSO_4.MgSO_4.K_2SO_4.2H_2O$ | ? | 18.56 | 16.12 |
| U | $MgSO_4.K_2SO_4.4H_2O$ + $2MgSO_4.K_2SO_4$ + $2CaSO_4.MgSO_4.K_2SO_4.2H_2O$ | ? | 28.51 | 7.86 |
| V | $2MgSO_4.K_2SO_4$ + $MgSO_4.H_2O$ + $2CaSO_4.MgSO_4.K_2SO_4.2H_2O$ | ? | 37.03 | 1.78 |
| W | $MgSO_4.H_2O$ + $2CaSO_4.MgSO_4.K_2SO_4.2H_2O$ + $4CaSO_4.MgSO_4.K_2SO_4.2H_2O$ | ? | 38.48 | 0.29 |
| Y | $2MgSO_4.K_2SO_4$ + $MgSO_4.K_2SO_4.4H_2O$ | | 36.36 | 7.85 |

D'Ans (94) obtained for the point R at 25°C, recalculated from M per 1000 M of water, 26.83% of $MgSO_4$ and 2.41% of $K_2SO_4$. He found the liquid phase at 25°C in equilibrium with the system $CaSO_4.2H_2O$ + $MgSO_4.7H_2O$ + $CaSO_4.K_2SO_4.4H_2O$ to contain 26.99% of $MgSO_4$ and 2.45% of $K_2SO_4$.

$SO_4^{--}$ $Mg^{++}$ $Na^+$ (11, 36, 97, 241, 257): $H_2O$ + $MgSO_4$ + $Na_2SO_4$; *v.* Fig. 127

| Solid phases | Liquid phase— % A = % $MgSO_4$; % B = % $Na_2SO_4$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 10°C | | $t$ = 18.7°C | | $t$ = 25°C | | $t$ = 30°C | | $t$ = 40°C | | $t$ = 50°C | | $t$ = 60°C | | $t$ = 80°C | | $t$ = 100°C | |
| | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B |
| $MgSO_4.12H_2O$ | 20.64 | | 23.90 | | | | | | | | | | | | | | | | | |
| $MgSO_4.12H_2O$? | 20.0 | 4.30 | | | | | | | | | | | | | | | | | | |
| | | | | | 26.2 | | 26.68 | | 29.0 | | 31.3 | | | | | | | | | |
| $MgSO_4.7H_2O$ | | | | | 25.7 | 0.5 | | | 24.5 | 9.27 | | | | | | | | | | |
| | | | | | 24.4 | 3.4 | | | | | | | | | | | | | | |
| | | | | | 20.6 | 11.48 | | | | | | | | | | | | | | |

$SO_4^{--}$ $Mg^{++}$ $Na^+$.—(*Continued*)

| Solid phases | Liquid phase— % A = % $MgSO_4$; % B = % $Na_2SO_4$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 10°C | | $t$ = 18.7°C | | $t$ = 25°C | | $t$ = 30°C | | $t$ = 40°C | | $t$ = 50°C | | $t$ = 60°C | | $t$ = 80°C | | $t$ = 100°C | |
| | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B |
| $MgSO_4.7H_2O + Na_2SO_4.10H_2O$ | 19.90 | 4.35 | 20.9 | 7.46 | 20.57 | 11.80 | | | | | | | | | | | | | | |
| $MgSO_4.7H_2O + MgSO_4.Na_2SO_4.4H_2O$ | | | | | | | 21.14 | 12.96 | 23.25 | 12.35 | 28.0 | 8.5 | | | | | | | | |
| $MgSO_4.6H_2O$ | | | | | | | | | | | | | 33.50 | | 35.50 | | | | | |
| | | | | | | | | | | | | | 31.10 | 6.06 | 33.80 | 3.55 | | | | |
| $MgSO_4.6H_2O + MgSO_4.Na_2SO_4.4H_2O$ | | | | | | | | | | | | | 31.3 | 5.70 | 33.8 | 4.60 | | | | |
| $MgSO_4.H_2O$ | | | | | | | | | | | | | | | | | 38.6 | | 40.6 | |
| | | | | | | | | | | | | | | | | | 36.3 | 4.9 | 32.0 | 6.07 |
| | | | | | | | | | | | | | | | | | 33.25 | 6.25 | 31.1 | 6.50 |
| $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ | | | | | | | | | | | | | | | | | 24.06 | 12.60 | 23.2 | 12.55 |
| | | | | | | | | | | | | | | | | | 18.10 | 17.85 | | |
| | | | | | | | | | | | | | | | | | 16.40 | 19.70 | | |
| | | | | | | | | | | | | | | | | | 14.70 | 22.0 | | |
| $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O + MgSO_4.3Na_2SO_4$ | | | | | | | | | | | | | | | | | 14.55 | 22.3 | 16.9 | 19.4 |
| | | | | | | | | | 15.8 | 18.6 | 24.8 | 10.35 | 28.3 | 7.1 | 25.9 | 9.60 | | | | |
| | | | | | | | | | 15.80 | 18.60 | 15.35 | 19.14 | 24.4 | 11.1 | 23.10 | 12.0 | | | | |
| $MgSO_4.Na_2SO_4.4H_2O$ | | | | | | | | | | | 12.20 | 23.20 | 18.4 | 16.05 | 18.2 | 15.80 | | | | |
| | | | | | | | | | | | | | 16.35 | 18.70 | 15.6 | 19.60 | | | | |
| | | | | | | | | | | | | | 14.10 | 21.8 | | | | | | |
| $MgSO_4.Na_2SO_4.4H_2O + Na_2SO_4.10H_2O$ | | | | | | | 16.62 | 17.76 | 12.30 | 23.25 | | | | | | | | | | |
| $MgSO_4.3Na_2SO_4$ | | | | | | | | | | | | | | | | | 14.20 | 22.25 | 13.75 | 20.6 |
| | | | | | | | | | | | | | | | | | 13.90 | 22.40 | 13.70 | 20.5 |
| | 11.25 | 4.69 | 19.4 | 7.4 | 15.70 | 12.30 | 10.93 | 19.17 | 6.48 | 26.08 | | | | | | | | | | |
| $Na_2SO_4.10H_2O$ | 9.65 | 4.89 | 0.75 | 8.3 | 8.92 | 13.90 | 3.20 | 20.69 | | 29.00 | | | | | | | | | | |
| | | 4.58 | | 8.3 | | 15.05 | | 21.79 | | | | | | | | | | | | |
| $MgSO_4.Na_2SO_4.4H_2O + MgSO_4.3Na_2SO_4$ | | | | | | | | | | | | | 13.70 | 23.80 | | | | | | |
| $MgSO_4.Na_2SO_4.4H_2O + Na_2SO_4$ | | | | | | | | | | | 11.6 | 24.50 | 12.70 | 25.0 | | | | | | |
| $Na_2SO_4 + MgSO_4.3Na_2SO_4$ | | | | | | | | | | | | | | | | | 4.29 | 28.10 | | |
| | | | | | | | | | | | 3.61 | 30.70 | 2.60 | 30.0 | 9.9 | 24.8 | | 30.4 | | 29.8 |
| $Na_2SO_4$ | | | | | | | | | | | | 32.80 | | 31.80 | 8.8 | 25.60 | | | | |
| | | | | | | | | | | | | | | | 5.04 | 28.0 | | | | |
| | | | | | | | | | | | | | | | | 31.20 | | | | |

| Solid phases (376)* | Liquid phase (376) | | | |
|---|---|---|---|---|
| | $t$ = 25°C | | $t$ = 30°C | |
| | % $MgSO_4$ | % $Na_2SO_4$ | % $MgSO_4$ | % $Na_2SO_4$ |
| $MgSO_4.8H_2O$ | 26.68 | | 26.35 | 3.96 |
| | 25.48 | 2.73 | 24.35 | 8.43 |
| | 25.04 | 3.54 | 22.89 | 11.80 |
| | 24.49 | 5.30 | 22.82 | 12.56 |
| | 23.49 | 7.50 | | |
| | 22.32 | 10.10 | | |
| | 21.79 | 11.98 | | |
| | 21.27 | 12.76 | | |

| Solid phases (376)* | Liquid phase (376) | | | |
|---|---|---|---|---|
| | $t$ = 25°C | | $t$ = 30°C | |
| | % $MgSO_4$ | % $Na_2SO_4$ | % $MgSO_4$ | % $Na_2SO_4$ |
| $MgSO_4.8H_2O + MgSO_4.7H_2O$ | | | 23.0 | 12.49 |
| $MgSO_4.7H_2O$ | | | 22.33 | 13.71 |
| | | | 21.91 | 14.47 |

* Takegami (376) found $MgSO_4.8H_2O$ to be stable at 25°C and up to 40°C in the presence of 7 to 9 % $Na_2SO_4$. He estimated that $MgSO_4.8H_2O \rightleftarrows MgSO_4.7H_2O$ at 48.2°C, also that $MgSO_4.7H_2O \rightleftarrows MgSO_4.6H_2O$ at 77.2°C. He found that $MgSO_4.8H_2O$ formed $MgSO_4.7H_2O$ when pressed between folds of filter paper He made the above solubility determinations.

## Invariant points and miscellaneous data

| °C | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % $MgSO_4$ | % $Na_2SO_4$ |
| −3.9 | $MgSO_4.12H_2O$ + Ice | 19.0 | |
| −6 | $MgSO_4.7H_2O$ + Ice | 19.0m | |
| −1.2 | $MgSO_4.10H_2O$ + Ice | | 4.0 |
| +1.8 | $MgSO_4.12H_2O + MgSO_4.7H_2O$ | 21.1 | |
| 15 | $MgSO_4.7H_2O + Na_2SO_4.10H_2O$ | 21.1 | 9.1 |
| 22* | $MgSO_4.7H_2O + Na_2SO_4.10H_2O + MgSO_4.Na_2SO_4.4H_2O$ | 20.0 | 14.9 |
| 24.5 | $MgSO_4.7H_2O + Na_2SO_4.10H_2O$ | 19.8m | 17.7m |
| 27* | $MgSO_4.Na_2SO_4.4H_2O + Na_2SO_4.10H_2O + Na_2SO_4$ | 12.5 | 23.3 |
| 32.38* | $Na_2SO_4.10H_2O + Na_2SO_4$ | | 33.6 |
| 18.5 | $MgSO_4.Na_2SO_4.4H_2O + MgSO_4.7H_2O$ | 18.3m | 17.3m |
| 35 | $MgSO_4.Na_2SO_4.4H_2O + MgSO_4.7H_2O$ | 25.7 | 8.9 |
| 35 | $MgSO_4.Na_2SO_4.4H_2O + Na_2SO_4$ | 12.1 | 22.3 |
| 46* | $MgSO_4.Na_2SO_4.4H_2O + MgSO_4.7H_2O + MgSO_4.6H_2O$ | 29.4 | 5.2 |
| 48.4 | $MgSO_4.7H_2O + MgSO_4.6H_2O$ | 33.0 | |
| 55 | $MgSO_4.Na_2SO_4.4H_2O + MgSO_4.6H_2O$ | 31.7 | 5.2 |
| 55 | $MgSO_4.Na_2SO_4.4H_2O + Na_2SO_4$ | 14.3 | 22.5 |
| 57* | $MgSO_4.Na_2SO_4.4H_2O + Na_2SO_4 + MgSO_4.3Na_2SO_4$ | 14.3 | 22.6 |
| 61* | $MgSO_4.Na_2SO_4.4H_2O + MgSO_4.Na_2SO_4.\frac{5}{2}H_2O + MgSO_4.6H_2O$ | 33.1 | 5.0 |
| 64* | $MgSO_4.H_2O + MgSO_4.6H_2O + MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ | 34.0 | 5.3 |
| 65 | $MgSO_4.H_2O + MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ | 34.2 | 5.2 |
| 65 | $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O + MgSO_4.Na_2SO_4.4H_2O$ | 26.8 | 9.4 |

**$SO_4^{--}$ $Mg^{++}$ $Na^+$**: Invariant points and miscellaneous data.—(*Continued*)

| °C | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % $MgSO_4$ | % $Na_2SO_4$ |
| 65 | $MgSO_4.Na_2SO_4.4H_2O$ + $MgSO_4.3Na_2SO_4$ | 14.6 | 21.0 |
| 65 | $MgSO_4.3Na_2SO_4$ + $Na_2SO_4$ | 13.4 | 23.0 |
| 68 | $MgSO_4.6H_2O$ + $MgSO_4.H_2O$ | 37.0 | |
| 71* | $MgSO_4.3Na_2SO_4$ + $MgSO_4.Na_2SO_4.4H_2O$ + $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ | 15.5 | 19.9 |
| 75 | $MgSO_4.6H_2O$ + $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ | 36.8m | 2.8m |
| 75 | $MgSO_4.H_2O$ + $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ | 33.5 | 5.5 |
| 75 | $MgSO_4.3Na_2SO_4$ + $Na_2SO_4$ | 12.8 | 23.2 |
| 80 | $MgSO_4.6H_2O$ + $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ | 38.4 | 2.8 |
| 90 | $MgSO_4.H_2O$ + $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ | 31.5 | 6.6 |
| 90 | $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ + $MgSO_4.3Na_2SO_4$ | 19.6 | 16.3 |
| 90 | $MgSO_4.3Na_2SO_4$ + $Na_2SO_4$ | 11.5 | 24.2 |
| 100 | $MgSO_4.6H_2O$ | 42.5 | |
| 103 | $MgSO_4.H_2O$ + $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ | 42.9m | 10.31m |
| 103 | $MgSO_4.Na_2SO_4.\frac{5}{2}H_2O$ + $Na_2SO_4$ | 27.92 | 25.4 |

* Interpolated.

**$SO_4^{--}$ $Mg^{++}$ $Na^+$ $K^+$**

$H_2O$ + $MgSO_4$ + $Na_2SO_4$ + $K_2SO_4$ (97)*; *v.* Figs. 128, 129, 130

| | Solid phases; *v.* Fig. 128 | Liquid phase—M per 1000M $H_2O$; figures in parentheses indicate values found by graphical interpolation | | |
|---|---|---|---|---|
| | | $t$ = 0°C | | |
| | | 0.5$Na_2SO_4$ | 0.5$K_2SO_4$ | 0.5$MgSO_4$ |
| A | $Na_2SO_4.10H_2O$ | 11.7 | | |
| B | $Na_2SO_4.10H_2O$ + $MgSO_4.7H_2O$ | 14.5 | | 78.6 |
| C | $MgSO_4.7H_2O$ | | | 80.5 |
| D | $MgSO_4.7H_2O$ + $MgSO_4.K_2SO_4.6H_2O$ | | (10) | (84) |
| E | $MgSO_4.K_2SO_4.6H_2O$ + $K_2SO_4$ | | 18.8 | 32 |
| F | $K_2SO_4$ | | 14.9 | |
| G | $K_2SO_4$ + $Na_2SO_4.10H_2O$ | 16.0 | 18.6 | |
| Q | $Na_2SO_4.10H_2O$ + $K_3Na(SO_4)_2$ + $MgSO_4.K_2SO_4.6H_2O$ | 10.4 | 25.5 | 31.8 |
| R | $K_3Na(SO_4)_2$ + $MgSO_4.K_2SO_4.6H_2O$ + $K_2SO_4$ | 15.8 | 21.0 | 32.4 |
| S | $MgSO_4.K_2SO_4.6H_2O$ + $Na_2SO_4.10H_2O$ + $MgSO_4.7H_2O$ | 13.8 | 10.2 | 81.0 |

D'Ans (97) using the work of Meyerhoffer and Saunders (269), shows the field for $K_3Na(SO_4)_2$ extending to the periphery of the diagram (line F-G-A). The work of Blasdale (35) indicates that this field must lie in interior of diagram; the position of P is conjectural.

| | *v.* Fig. 129 | $t$ = 35°C | | |
|---|---|---|---|---|
| A | $Na_2SO_4$ | 125.2 | | |
| B | $Na_2SO_4$ + $Na_2SO_4.MgSO_4.4H_2O$ | 86.0 | | 55.2 |
| C | $Na_2SO_4.MgSO_4.4H_2O$ + $MgSO_4.7H_2O$ | 34.6 | | 117.6 |
| D | $MgSO_4.7H_2O$ | | | (130.0) |
| E | $MgSO_4.7H_2O$ + $MgSO_4.K_2SO_4.6H_2O$ | | (15.0) | (128.0) |
| F | $MgSO_4.K_2SO_4.6H_2O$ + $K_2SO_4$ | | (36.5) | 56.0 |
| G | $K_2SO_4$ | | 28.7 | |
| H | $K_2SO_4$ + $K_3Na(SO_4)_2$ | 18.8 | 30.6 | |
| I | $K_3Na(SO_4)_2$ + $Na_2SO_4$ | 117.4 | 17.8 | |
| P | $Na_2SO_4$ + $K_3Na(SO_4)_2$ + $Na_2SO_4.MgSO_4.4H_2O$ | 99.8 | 16.6 | 41.6 |
| Q | $Na_2SO_4.MgSO_4.4H_2O$ + $K_3Na(SO_4)_2$ + $MgSO_4.K_2SO_4.6H_2O$ | 65.2 | 22.6 | 71.4 |
| R | $K_2SO_4$ + $MgSO_4.K_2SO_4.6H_2O$ + $K_3Na(SO_4)_2$ | 15.2 | 33.2 | 53.0 |
| S | $MgSO_4.K_2SO_4.6H_2O$ + $Na_2SO_4.MgSO_4.4H_2O$ + $MgSO_4.7H_2O$ | 46.6 | 12.4 | 119.6 |
| | | $t$ = 55°C | | |
| | $Na_2SO_4$ | 117.0 | | |
| | $Na_2SO_4$ + $Na_2SO_4.MgSO_4.4H_2O$ | 90.2 | | 67.8 |
| | $Na_2SO_4.MgSO_4.4H_2O$ + $MgSO_4.7H_2O$ | (21.0) | | (150.2) |
| | $MgSO_4.7H_2O$ | | | (156) |
| | $MgSO_4.7H_2O$ + $K_2SO_4.MgSO_4.4H_2O$ | | (16) | (160) |
| | $K_2SO_4.MgSO_4.4H_2O$ + $K_2SO_4$ | | 47.4 | 86.2 |
| | $K_2SO_4$ | | 35.8 | |
| | $K_2SO_4$ + $K_3Na(SO_4)_2$ | (24) | (35) | |
| | $K_3Na(SO_4)_2$ + $Na_2SO_4$ | (110) | (24) | |
| | $K_3Na(SO_4)_2$ + $Na_2SO_4.MgSO_4.4H_2O$ + $Na_2SO_4$ | 84.4 | 21.8 | 61.8 |
| | $K_3Na(SO_4)_2$ + $Na_2SO_4.MgSO_4.4H_2O$ + $K_2SO_4.MgSO_4.4H_2O$ | 51.0 | 23.2 | 96.4 |
| | $K_2SO_4$ + $K_3Na(SO_4)_2$ + $K_2SO_4.MgSO_4.4H_2O$ | 15.0 | 40.2 | 71.2 |

* Gives much data compiled from other sources. The mineralogical names given to the solid phases here concerned will be found on p. 284.

$SO_4^{--}$ $Mg^{++}$ $Na^+$ $K^+$.—(*Continued*)

| | Solid phases | Liquid phase—M per 1000M $H_2O$; figures in parentheses indicate values found by graphical interpolation | | |
|---|---|---|---|---|
| | | 0.5$Na_2SO_4$ | 0.5$K_2SO_4$ | 0.5$MgSO_4$ |
| | *v.* Fig. 130 | $t$ = 90°C | | |
| A | $Na_2SO_4$ | 108.7 | | |
| B | $Na_2SO_4$ + $MgSO_4.3Na_2SO_4$ | 95.0 | | 53.0 |
| C | $MgSO_4.3Na_2SO_4$ + $Na_2SO_4.MgSO_4.\frac{5}{2}H_2O$ | 64.4 | | 91.4 |
| D | $Na_2SO_4.MgSO_4.\frac{5}{2}H_2O$ + $MgSO_4.H_2O$ | 27.2 | | 152.0 |
| E | $MgSO_4.H_2O$ | | | 203.0 |
| F | $MgSO_4.H_2O$ + $K_2SO_4.2MgSO_4$ | | (3) | (186) |
| G | $K_2SO_4.2MgSO_4$ + $K_2SO_4$ | | (54) | (82) |
| H | $K_2SO_4$ | | 47.10 | |
| I | $K_2SO_4$ + $K_3Na(SO_4)_2$ | 35.2 | 40 | |
| J | $K_3Na(SO_4)_2$ + $Na_2SO_4$ | 107 | 27.2 | |
| P | $Na_2SO_4$ + $MgSO_4.3Na_2SO_4$ + $K_3Na(SO_4)_2$ | 91.4 | 29.6 | 44.2 |
| Q | $MgSO_4.3Na_2SO_4$ + $K_3Na(SO_4)_2$ + $Na_2SO_4.MgSO_4.\frac{5}{2}H_2O$ | 62.2 | 35.4 | 89.0 |
| R | $Na_2SO_4.MgSO_4.\frac{5}{2}H_2O$ + $K_2SO_4.2MgSO_4$ + $K_3Na(SO_4)_2$ | 55 | 40.2 | 104.4 |
| S | $K_2SO_4$ + $K_2SO_4.2MgSO_4$ + $K_3Na(SO_4)_2$ | 29.24 | 46.6 | 99.8 |
| T | $Na_2SO_4.MgSO_4.\frac{5}{2}H_2O$ + $K_2SO_4.2MgSO_4$ + $MgSO_4.H_2O$ | 18.4 | 9.8 | 165 |

$SO_4^{--}$ $Mg^{++}$ $K^+$ (97, 170, 203, 206)
$H_2O$ + $MgSO_4$ + $K_2SO_4$; *v.* Fig. 131

| °C | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % $MgSO_4$ | % $K_2SO_4$ |
| −5.15 | $MgSO_4.12H_2O$ + $K_2SO_4.MgSO_4.6H_2O$ + Ice | | |
| −3.9 | $MgSO_4.12H_2O$ + Ice | | |
| −3.0 | $K_2SO_4$ + $K_2SO_4.MgSO_4.6H_2O$ + Ice | | |
| 0 | $K_2SO_4$ | | 6.85 |
| 0 | $K_2SO_4$ + $K_2SO_4.MgSO_4.6H_2O$ | 8.93 | 7.60 |
| +1.8 | $MgSO_4.12H_2O$ + $MgSO_4.7H_2O$ | 23.60 | |
| 7 | $MgSO_4.12H_2O$ + $MgSO_4.7H_2O$ + $K_2SO_4.MgSO_4.6H_2O$ | 21.15 | 3.36 |
| 41 | $MgSO_4.7H_2O$ + $K_2SO_4.MgSO_4.6H_2O$ + $K_2SO_4.MgSO_4.4H_2O$ | | |
| 45 | $K_2SO_4$ + $K_2SO_4.MgSO_4.6H_2O$ | 17.72 | 14.13 |
| 45 | $K_2SO_4.MgSO_4.6H_2O$ + $K_2SO_4.MgSO_4.4H_2O$ | 25.40 | 7.00 |
| 45 | $K_2SO_4.MgSO_4.4H_2O$ + $MgSO_4.7H_2O$ | 31.73 | 4.68 |
| 47.2 | $MgSO_4.7H_2O$ + $MgSO_4.6H_2O$ + $K_2SO_4.MgSO_4.4H_2O$ | | |
| 47.5 | $K_2SO_4$ + $K_2SO_4.MgSO_4.6H_2O$ + $K_2SO_4.MgSO_4.4H_2O$ | | |
| 48.4 | $MgSO_4.7H_2O$ + $MgSO_4.6H_2O$ | 33.0 | |
| 55 | $K_2SO_4$ + $K_2SO_4.MgSO_4.4H_2O$ | 19.00 | 15.12 |
| 61 | $MgSO_4.6H_2O$ + $K_2SO_4.MgSO_4.4H_2O$ + $K_2SO_4.2MgSO_4$ | | |
| 66.5 | $MgSO_4.6H_2O$ + $MgSO_4.H_2O$ + $K_2SO_4.2MgSO_4$ | | |
| 68 | $MgSO_4.6H_2O$ + $MgSO_4.H_2O$ | 37.00 | |
| 70 | $MgSO_4.H_2O$ + $K_2SO_4.2MgSO_4$ | 35.32 | 3.77 |
| 70 | $K_2SO_4.MgSO_4.4H_2O$ + $K_2SO_4.2MgSO_4$ | 32.24 | 6.10 |
| 83 | $K_2SO_4$ + $K_2SO_4.MgSO_4.4H_2O$ | 18.50 | 16.13 |
| 83 | $MgSO_4.H_2O$ + $K_2SO_4.2MgSO_4$ | 37.10 | 1.74 |
| 83 | $K_2SO_4.MgSO_4.4H_2O$ + $K_2SO_4.2MgSO_4$ | 28.73 | 7.86 |
| 88.5 | $K_2SO_4$ + $K_2SO_4.2MgSO_4$ | 17.86 | 17.02 |
| 89 | $K_2SO_4$ + $K_2SO_4.MgSO_4.4H_2O$ + $K_2SO_4.2MgSO_4$ | | |
| 90 | $K_2SO_4$ + $K_2SO_4.MgSO_4.4H_2O$ | 18.50 | 16.98 |

$SO_4^{--}$ $Mg^{++}$ $K^+$.—(*Continued*)

| Solid phases (231, 393) | Liquid phase | | | |
|---|---|---|---|---|
| | $t$ = 25°C* | | $t$ = 30°C† | |
| | A‡ | B‡ | A‡ | B‡ |
| | | 10.77 | | 11.20 |
| | 4.0 | 11.03 | 3.45 | 11.98 |
| $K_2SO_4$ | 7.8 | 11.10 | 9.49 | 12.64 |
| | 10.69 | 10.84 | | |
| | 12.06 | 10.77 | | |
| $K_2SO_4$ + $MgSO_4.K_2SO_4.6H_2O$ | 12.68 | 10.70 | | |
| | 12.88 | 10.51 | 12.88 | 12.47 |
| | 13.26 | 10.34 | 13.19 | 11.66 |
| | 14.27 | 9.63 | 18.08 | 8.59 |
| $MgSO_4.K_2SO_4.6H_2O$ | 16.36 | 8.43 | 26.05 | 6.93 |
| | 18.76 | 7.20 | 26.29 | 6.60 |
| | 24.44 | 4.70 | 26.20 | 5.98 |
| | 26.12 | 4.11 | 27.69 | 3.41 |
| $MgSO_4.K_2SO_4.6H_2O$ + $MgSO_4.7H_2O$ | 26.39 | 4.02 | | |
| | 26.36 | 3.76 | | |
| | 26.57 | 2.34 | | |
| $MgSO_4.7H_2O$ | 26.67 | 1.68 | | |
| | 26.76 | | 29.03 | |

* Data from van Klooster, recalculated from M per 1000M of water.
† Data from Weston; his work shows that $MgSO_4.K_2SO_4.6H_2O$ may dissolve $MgSO_4.6H_2O$ and form solid solutions. ‡ A = % $MgSO_4$; B = % $K_2SO_4$.

$SO_4^{--}$ $Ca^{++}$ (60): $H_2O$ + $H_2SO_4$ + $CaSO_4$

| g $H_2SO_4$/l | g $CaSO_4$/l | g $H_2SO_4$/l | g $CaSO_4$/l |
|---|---|---|---|
| $CaSO_4.2H_2O$ | | | |
| $t$ = 25° | | $t$ = 35°C | |
| 0 | 2.126 | 48.67 | 3.397 |
| 0.48 | 2.128 | 97.35 | 3.606 |
| 4.87 | 2.144 | 146.01 | 3.150 |
| 8.11 | 2.203 | $t$ = 43°C | |
| 16.22 | 2.382 | 0 | 2.145 |
| 48.67 | 2.727 | 0.48 | 2.236 |
| 75.00 | 2.841 | 4.87 | 2.456 |
| 97.35 | 2.779 | 8.11 | 2.760 |
| 146.01 | 2.571 | 16.22 | 3.116 |
| 194.70 | 2.313 | 48.67 | 3.843 |
| 243.35 | 1.901 | 75.00 | 4.146 |
| 292.02 | 1.541 | 146.01 | 4.139 |
| $t$ = 35°C | | 194.70 | 3.551 |
| 0.48 | 2.209 | 243.35 | 2.959 |
| 4.87 | 2.451 | 292.02 | 2.481 |

### $SO_4^{--}$ $Ca^{++}$.—(*Cont'd*)

$H_2O + Ca(OH)_2 + CaSO_4$

$t$ = 25°C (56)

| g CaO/l | g $CaSO_4$/l |
|---|---|
| $CaO.H_2O$ | |
| 1.166 | 0 |
| 1.141 | 0.391 |
| 1.150 | 0.666 |
| 1.215 | 0.955 |
| 1.242 | 1.214 |
| 1.222 | 1.588 |
| $CaSO_4.2H_2O$ | |
| 0.939 | 1.634 |
| 0.611 | 1.722 |
| 0.349 | 1.853 |
| 0.176 | 1.918 |
| 0.062 | 2.032 |
| 0 | 2.126 |

### $SO_4^{--}$ $Ca^{++}$ $Na^+$

$H_2O + CaSO_4 + Na_2SO_4$

$t$ = 22°C (68)

| g $CaSO_4$/l | g $Na_2SO_4$/l |
|---|---|
| $CaSO_4.2H_2O$ | |
| 2.084 | 0 |
| 1.583 | 2.771 |
| 1.433 | 13.820 |
| 1.408 | 16.360 |
| 1.569 | 39.310 |
| 1.841 | 77.320 |
| 2.185 | 133.000 |
| 2.414 | 193.80 |
| $CaSO_4.2H_2O$ + $Na_2SO_4.10H_2O$ | |
| 2.578 | 222.58 |

$t$ = 25°C (61, 62)

| % $CaSO_4$ | % $Na_2SO_4$ |
|---|---|
| $CaSO_4.2H_2O$ | |
| 0.165 | 0.239 |
| 0.145 | 0.946 |
| 0.137 | 1.397 |
| 0.144 | 2.388 |
| 0.152 | 3.585 |
| 0.159 | 4.441 |
| 0.183 | 8.728 |
| 0.191 | 10.496 |
| 0.196 | 12.830 |
| 0.213 | 17.437 |
| $CaSO_4.2H_2O$ + $Na_2SO_4.10H_2O$ | |
| 0.219 | 21.007 |

$t$ = 29°C (94)

M per 1000M $H_2O$

| $CaSO_4$ | $Na_2SO_4$ |
|---|---|
| $CaSO_4.2H_2O$ + $Na_2SO_4$.- $CaSO_4$ + $Na_2SO_4.10H_2O$ | |
| 0.35 | 47.0 |

$t$ = 60°C (94)

| $CaSO_4.2H_2O$ + $Na_2SO_4$.- $CaSO_4$* | |
|---|---|
| 0.604 | 31.2 |

* A second labile calcium sodium sulfate has been found by several investigators. van't Hoff (188) found the transition temperature for $CaSO_4$.-$2H_2O$ + $Na_2SO_4.10H_2O$ + labile sulfate to be 30.2°C; he, and also Cameron and Seidell (68), assigned to it the formula $CaSO_4.Na_2SO_4.2H_2O$, but D'Ans found $CaSO_4.2Na_2SO_4.2H_2O$.

### $SO_4^{--}$ $Ca^{++}$ $Na^+$

$H_2O + Ca(OH)_2 + Na_2SO_4$

$t$ = 25°C (98)

M per 1000g soln.

| $Na_2SO_4$ | NaOH |
|---|---|
| $Na_2SO_4.10H_2O$ + $CaSO_4$.- $2H_2O$ | |
| 1.54 *ca.* | 0.0 |
| $Na_2SO_4.10H_2O$ + $CaSO_4$.- $2H_2O$ + $Ca(OH)_2$ | |
| 1.41 | 2.96 |

### $SO_4^{--}$ $Ca^{++}$ $K^+$

$H_2O + CaSO_4 + K_2SO_4$ (4, 5, 94, 205, 207)

*v.* Fig. 132

| °C | % $K_2SO_4$ | % $CaSO_4$ |
|---|---|---|
| $CaSO_4.2H_2O$ + $CaSO_4$.- $K_2SO_4.H_2O$ | | |
| 0 | 2.07 | |
| 25 | 3.04 | |
| $CaSO_4.2H_2O$ + $CaSO_4$.- $K_2SO_4.H_2O$ + $5CaSO_4$.- $K_2SO_4.H_2O$ | | |
| 31.8 | 3.49 | |
| $CaSO_4.K_2SO_4.H_2O$ + $5CaSO_4$.- $K_2SO_4.H_2O$ | | |
| 40 | 4.01 | |
| 60 | 6.10 | |
| 83 | 8.72 | |
| 100 | 8.21 | 0.10 |
| $CaSO_4.2H_2O$ + $5CaSO_4$.- $K_2SO_4.H_2O$ | | |
| 40 | 3.56 | |
| 60 | 2.27 | |
| 83 | 1.22 | |
| 100 | 1.05 | 0.24 |

$t$ = 25°C (61)

| % $CaSO_4$ | % $K_2SO_4$ |
|---|---|
| $CaSO_4.2H_2O$ | |
| 0.156 | 0.508 |
| 0.144 | 0.978 |
| 0.146 | 1.928 |
| 0.152 | 2.772 |
| 0.155 | 2.995 |
| 0.151 | 3.041 |
| $CaSO_4.2H_2O$ + $CaSO_4.K_2SO_4$.- $H_2O$ | |
| 0.154 | 3.167 |
| $CaSO_4.K_2SO_4.H_2O$ | |
| 0.122 | 3.426 |
| 0.118 | 3.483 |
| 0.094 | 3.932 |
| 0.078 | 4.532 |
| 0.042 | 7.131 |
| 0.030 | 10.394 |

### $SO_4^{--}$ $Ca^{++}$ $K^+$

$H_2O + H_2SO_4 + CaSO_4 + K_2SO_4$

$t$ = 25°C (94)

M per 1000M $H_2O$

| $H_2SO_4$ | $K_2SO_4$ | $CaSO_4$ |
|---|---|---|
| $CaSO_4.2H_2O$ + $CaSO_4$.- $K_2SO_4.H_2O$ | | |
| 0.394 | 3.22 | 0.205 |
| 1.946 | 3.58 | 0.252 |

### $SO_4^{--}$ $Ca^{++}$ $K^+$.—(*Continued*)

M per 1000M $H_2O$

| $H_2SO_4$ | $K_2SO_4$ | $CaSO_4$ |
|---|---|---|
| $CaSO_4.2H_2O$ + $CaSO_4$.- $K_2SO_4.H_2O$ | | |
| 19.470 | 6.73 | 0.489 |
| 33.590 | 8.74 | 0.360 |
| 72.450 | 14.79 | 0.309 |
| $CaSO_4.2H_2O$ + $CaSO_4$.- $K_2SO_4.H_2O$ + KHSO$_4$ | | |
| 87.84 | 19.04 | 0.275 |

### $SO_4^{--}$ $Ca^{++}$ $K^+$ (174)

$H_2O + Ca(OH)_2 + K_2SO_4$

| °C | $M_{OH^-}$/l | $M_{SO_4^{--}}$/l |
|---|---|---|
| $CaSO_4.2H_2O$ + $Ca(OH)_2$ + $CaSO_4.K_2SO_4.H_2O$ | | |
| 0 | 0.125 | 0.123 |
| 20 | 0.118 | 0.152 |
| 70 | 0.074 | 0.225 |
| 150 | 0.094 | 0.320 |

$t$ = 25°C (98)

M per 100g soln.

| $K_2SO_4$ | KOH |
|---|---|
| $Ca(OH)_2$ + $K_2SO_4$ + $K_2SO_4$.- $CaSO_4.H_2O$ | |
| 0.433 | 0.515 |
| $Ca(OH)_2$ + $CaSO_4.2H_2O$ + $K_2SO_4.CaSO_4.H_2O$ | |
| 0.158 | 0.114 |

### $SO_4^{--}$ $Ca^{++}$ $Cs^+$ (94)

$H_2O + CaSO_4 + Cs_2SO_4$

| $t$ = 25°C | $t$ = 60°C |
|---|---|
| M per 1000M $H_2O$ | |
| $SO_3$ | $SO_3$ |
| $CaSO_4.2H_2O$ + 2$CaSO_4$.- $Cs_2SO_4$ | |
| 14 | 12.4 |

### $SO_4^{--}$ $Ra^{++}$

$H_2O + H_2SO_4 + RaSO_4$

$t$ = 25°C (246)

| % $H_2SO_4$ | g $RaSO_4$/l |
|---|---|
| $RaSO_4$ | |
| 0.0 | 0.000021 |
| 0.049 | 0.0000205 |
| 0.489 | 0.000022 |
| 4.74 | 0.000022 |
| 10 | 0.000024 |
| 15 | 0.000024 |
| 25 | 0.000023 |
| 30 | 0.000023 |
| 45 | 0.000019 |
| 50 | 0.000021 |
| 55 | 0.000034 |
| 60 | 0.000063 |
| 65 | 0.000064 |

### $SO_4^{--}$ $Ca^{++}$ $Rb^+$ (94)

$H_2O + CaSO_4 + Rb_2SO_4$; *v.* Fig. 133

| Solid phases | Liquid phase—M per 1000M $H_2O$ | |
|---|---|---|
| | °C | $SO_3$ |
| $CaSO_4.2H_2O$ + $CaSO_4.Rb_2SO_4.H_2O$ | 0 | 16.9 |
| $CaSO_4.2H_2O$ + 2$CaSO_4.Rb_2SO_4$ | 25 | 18.79 |
| $CaSO_4.Rb_2SO_4.H_2O$ + 2$CaSO_4.Rb_2SO_4$ | 25 | 26.02* |
| $CaSO_4.Rb_2SO_4.H_2O$ + 2$CaSO_4.Rb_2SO_4$ | 40 | 39.50 |
| $CaSO_4.2H_2O$ + 2$CaSO_4.Rb_2SO_4$ | 50 | 13.10 |

* Composed of 25.52 $Rb_2SO_4$ and 0.5 $CaSO_4$.

### $SO_4^{--}$ $Li^+$

$H_2O + H_2SO_4 + Li_2SO_4$

$t$ = 30°C (137); *v.* Fig. 134

| | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % $H_2SO_4$ | % $Li_2SO_4$ |
| A | | | 25.10 |
| B | | 5.05 | 22.74 |
| C | $Li_2SO_4.H_2O$ | 16.60 | 19.10 |
| D | | 32.7 | 13.37 |
| E | | 48.0 | 10.20 |
| F | $Li_2SO_4.H_2O$ + $Li_2SO_4$ | 55.00 | 13.00 |
| G | $Li_2SO_4$ | 56.30 | 13.87 |
| H | $Li_2SO_4$ + $Li_2SO_4.H_2SO_4$ | 62.40 | 18.50 |
| I | | 69.40 | 13.75 |
| J | $Li_2SO_4.H_2SO_4$ | 78.23 | 11.64 |
| K | | 83.43 | 15.65 |

## $SO_4^{--}$ $Na^+$: $H_2O + H_2SO_4 + NaOH$

$t = 25°C$ [96]; *v.* Fig. 135

| | Solid phases | Liquid phase—M per 1000g soln. $SO_3$ | $Na_2O$ |
|---|---|---|---|
| A | $NaHS_2O_7$(?) | 10.78 | 0.302 |
| | | 9.98 | 0.908 |
| B | | 9.85 | 0.787 |
| C | | 9.48 | 0.953 |
| | $NaHS_2O_7$ | 9.55 | 0.775 |
| D | | 9.18 | 0.567 |
| E | $Na_2SO_4.\frac{2}{3}H_2SO_4 + NaHS_2O_7$ | 9.36 | 0.425 |
| F | $Na_2SO_4.\frac{2}{3}H_2SO_4$ | 9.08 | 0.394 |
| G | $NaH_3(SO_4)_2.H_2O + Na_2SO_4.\frac{2}{3}H_2SO_4$ | 8.87 | 0.445 |
| | | 8.86 | 0.156 |
| H | | 8.70 | 0.076 |
| | $NaH_3(SO_4)_2.H_2O$ | 8.61 | 0.899 |
| | | 8.12 | 0.037 |
| I | | 7.36 | 0.071 |
| J | $NaHSO_4 + NaH_3(SO_4)_2.H_2O$ | 6.64 | 0.297 |
| K | $NaHSO_4$ | 5.91 | 0.409 |

$t = 25°C$ [98]

| M per 1000g soln. NaOH | $Na_2SO_4$ | NaOH | $Na_2SO_4$ |
|---|---|---|---|
| $Na_2SO_4.10H_2O$ | | $Na_2SO_4$ | |
| 0.0 | 1.54* | 4.04 | 0.59 |
| 0.148 | 1.41 | 5.64 | 0.24 |
| 1.400 | 1.08 | 7.04 | 0.126 |
| | | 11.66 | 0.013 |
| $Na_2SO_4.10H_2O + Na_2SO_4$ | | $NaOH.H_2O$ | |
| 2.94 | 0.90 | 13.24* | 0.0 |

* Work of other investigators.

| Solid phases [135] | Liquid phase† $t = 12°C$ % A‡ | % B‡ | $t = 25°C$ % A‡ | % B‡ |
|---|---|---|---|---|
| $Na_2SO_4.10H_2O$ | | 9.48* | | 21.90 |
| $Na_2SO_4.10H_2O + Na_3H(SO_4)_2$ | 16.52* | 32.93* | | |
| $Na_2SO_4.10H_2O + Na_2SO_4$ | | | 8.62* | 34.48* |
| $Na_3H(SO_4)_2 + NaHSO_4.H_2O$ | 27.96* | 25.42* | 30.58* | 27.02* |
| $Na_3H(SO_4)_2 + Na_2SO_4$ | | | 16.27* | 35.37* |
| $NaHSO_4.H_2O$ | 58.79 | 4.33 | 56.25 | 6.54 |

* Mean of two results. † For discussion of practical use of these data, *v.* [322].
‡ A = $H_2SO_4$; B = $Na_2SO_4$.

## $SO_4^{--}$ $Na^+$ $K^+$ [35, 97, 190, 269]: $H_2O + Na_2SO_4 + K_2SO_4$

| Solid phases* | Liquid phase $t = 0°C$ % $K_2SO_4$ | % $Na_2SO_4$ | $t = 25°C$ % $K_2SO_4$ | % $Na_2SO_4$ | $t = 35°C$ % $K_2SO_4$ | % $Na_2SO_4$ | $t = 50°C$ % $K_2SO_4$ | % $Na_2SO_4$ | $t = 60°C$ % $K_2SO_4$ | % $Na_2SO_4$ | $t = 75°C$ % $K_2SO_4$ | % $Na_2SO_4$ | $t = 90°C$ % $K_2SO_4$ | % $Na_2SO_4$ | $t = 100°C$ % $K_2SO_4$ | % $Na_2SO_4$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $K_2SO_4$ | 6.74 | | 10.73 | | | | 14.59 | | | | 17.22 | | | | 18.98 | |
| $K_2SO_4 + K_3Na(SO_4)_2$ | | | 11.04 | 5.58 | 6.07 | 12.11 | 13.98 | 5.47 | 14.13 | 6.51 | 14.45 | 7.84 | 14.57 | 10.42 | 15.29 | 10.12 |
| $K_3Na(SO_4)_2 + Na_2SO_4.10H_2O$ | | | 6.63 | 22.08 | | | | | | | | | | | | |
| $K_3Na(SO_4)_2 + Na_2SO_4$ | | | | | 5.55 | 29.90 | 6.06 | 29.47 | 8.12 | 27.35 | 7.65 | 27.34 | 8.47 | 27.17 | 8.77 | 26.84 |
| $K_2SO_4 + Na_2SO_4.10H_2O$ | 7.80 | 5.46 | | | | | | | | | | | | | | |
| $Na_2SO_4.10H_2O$ | | 4.50 | | 21.83 | | | | | | | | | | | | |
| $Na_2SO_4$ | | | | | | | | 30.96 | | | | 30.27 | | | | 29.42 |

Invariant point: $Na_2SO_4.10H_2O + Na_2SO_4 + K_3Na(SO_4)_2$ at 30.1°C.

* Osaka [287] determined the composition of the double salt in equilibrium with solutions of varying composition at 15, 25, 40, 50, 60, 70 and 80°C. The results show that $K_3Na(SO_4)_2$ dissolves $Na_2SO_4$ to a slight extent, but not $K_2SO_4$. This is in accord with the work of van't Hoff and Barschall [190] and other investigators.

$SO_4^{--}$ $Na^+$ $Cs^+$; *v.* p. 355

## $SO_4^{--}$ $K^+$: $H_2O + H_2SO_4 + K_2O$

| | Solid phases $t = 25°C$ [96]; *v.* Fig. 136 | Liquid phase—M per 1000g soln. $SO_3$ | $K_2O$ |
|---|---|---|---|
| A | $KHS_2O_7$ | 9.66 | 0.937 |
| | | 9.80 | 0.665 |
| B | $KH_3(SO_4)_2 + KHS_2O_7$ | 8.65 | 0.880 |
| C | $KH_3(SO_4)_2$ | 8.57 | 0.384 |
| | | 8.45 | 0.325 |
| D | $KH_3(SO_4)_2.H_2O + KH_3(SO_4)_2$ | 8.16 | 0.364 |
| | | 8.15 | 0.352 |
| E | $KH_3(SO_4)_2.H_2O$ | 7.88 | 0.167 |
| | | 7.26 | 0.182 |
| F | $KHSO_4 + KH_3(SO_4)_2.H_2O$ | 6.91 | 0.266 |
| G | $KHSO_4$ | 6.40 | 0.171 |

| | Solid phases $t = 18°C$ [369]; *v.* Fig. 137 | Liquid phase % $K_2SO_4$ | % $H_2SO_4$ |
|---|---|---|---|
| A | | 9.72 | 0 |
| B | $K_2SO_4$ | 13.04 | 4.38 |
| C | | 18.04 | 11.01 |
| | | 19.29 | 12.51 |
| E | $3K_2SO_4.H_2SO_4$ | 18.95 | 14.50 |
| F | | 18.62 | 18.80 |
| | $5K_2SO_4.3H_2SO_4$ | 18.06 | 21.02 |
| | $8K_2SO_4.6H_2SO_4$ | 17.07 | 20.95 |
| I | $8K_2SO_4.6H_2SO_4 + K_2SO_4.H_2SO_4$ | 14.81 | 22.93 |
| J | | 10.40 | 26.52 |
| K | $K_2SO_4.H_2SO_4$ | 7.23 | 29.90 |
| L | | 5.05 | 33.95 |
| | | 2.08 | 60.37 |

**$SO_4^{--}$ $K^+$.**—(*Continued*)
M per 1000g soln.; $t$ = 25°C (98)

| KOH | $K_2SO_4$ | KOH | $K_2SO_4$ |
|---|---|---|---|
| $K_2SO_4$ | | $K_2SO_4$ | |
| 0.0 | 0.617* | 5.72 | 0.035 |
| 0.516 | 0.433 | 6.84 | 0.009 |
| 0.866 | 0.280 | $KOH.2H_2O$ | |
| 2.260 | 0.137 | 9.618* | 0.0 |

* Work of other investigators.

**$SO_4^{--}$ $Na^+$ $Cs^+$**: $H_2O + Na_2SO_4 + Cs_2SO_4$; $t$ = 25°C (132)

| % $Cs_2SO_4$ | % $Na_2SO_4$ | Solid phases |
|---|---|---|
| 54.7 | 11.45 | $Cs_2SO_4 + Na_2SO_4$ |

**$HSO_4^-$ $HTeO_4^-$ $Rb^+$**: $H_2O + RbHSO_4 + RbHTeO_4$

| Solid phase | Liquid phase—$t$ = 25°C (298) | |
|---|---|---|
| M % $RbHSO_4$* | g $RbHSO_4$/l | g $RbHTeO_4$/l |
| 47.91 | 26.675 | 38.403 |
| 50.33 | 32.117 | 31.580 |
| 50.74 | 42.917 | 26.764 |
| 50.99 | 59.074 | 20.182 |
| 52.52 | 498.25 | 0.02887 |

* Solid soln.

**$S_2O_3^{--}$ $NO_3^-$ $Na^+$ (237)**: $H_2O + Na_2S_2O_3 + NaNO_3$

| Solid phases | Liquid phase | | | |
|---|---|---|---|---|
| | $t$ = 9°C | | $t$ = 25°C | |
| | % $NaNO_3$ | % $Na_2S_2O_3$ | % $NaNO_3$ | % $Na_2S_2O_3$ |
| $NaNO_3$ | 44.60 | | 47.90 | |
| $NaNO_3 + Na_2S_2O_3.5H_2O$ | 22.58 | 23.41 | 20.40 | 31.95 |
| $Na_2S_2O_3.5H_2O$ | | 37.89 | | 43.51 |

**$S_2O_3^{--}$ $NO_3^-$ $Ca^{++}$ (237)**: $H_2O + CaS_2O_3 + Ca(NO_3)_2$

| Solid phases | Liquid phase | | | |
|---|---|---|---|---|
| | $t$ = 9°C | | $t$ = 25°C | |
| | % $CaS_2O_3$ | % $Ca(NO_3)_2$ | % $CaS_2O_3$ | % $Ca(NO_3)_2$ |
| $CaS_2O_3.6H_2O$ | 29.34 | | 34.68 | |
| $CaS_2O_3.6H_2O + Ca(NO_3)_2.4H_2O$ | 6.81 | 45.68 | 13.00 | 45.92 |
| $Ca(NO_3)_2.4H_2O$ | | 51.53 | | 58.64 |

**$S_2O_3^{--}$ $Pb^{++}$ $Sr^{++}$**
$H_2O + PbS_2O_3 + SrS_2O_3$
$t$ = 25°C (129)

| Solid phase—M % | | Liquid phase—M per l | |
|---|---|---|---|
| $PbS_2O_3.4H_2O$ | $SrS_2O_3.4H_2O$ | $PbS_2O_3$ | $SrS_2O_3$ |
| 0.00 | 100.00 | 0.00 | 0.5881 |
| 0.30 | 99.70 | 0.008 | 0.6105 |
| 3.87 | 96.13 | 0.1112 | 0.6155 |
| 9.84 | 90.16 | 0.4062 | 0.4623 |
| 19.26 | 80.74 | 0.6977 | 0.3433 |
| 23.73 | 76.27 | 0.8453 | 0.2705 |
| 32.24 | 67.76 | 1.0185 | 0.2858 |
| 49.97 | 50.13 | 1.388 | 0.1841 |
| 100.00 | 0.0 | 1.0198 | 0.00 |

**$S_2O_3^{--}$ $NO_3^-$ $Ca^{++}$ $Na^+$ (237)**: $H_2O + Ca(NO_3)_2 + Na_2S_2O_3$; *v.* Fig. 138

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 9°C; *v.* Fig. 138 | | | | $t$ = 25°C | | | |
| | | $NaNO_3$ | 0.5Ca-$(NO_3)_2$ | 0.5$Na_2$-$S_2O_3$ | 0.5Ca-$S_2O_3$ | $NaNO_3$ | 0.5Ca-$(NO_3)_2$ | 0.5$Na_2$-$S_2O_3$ | 0.5Ca-$S_2O_3$ |
| A | $CaS_2O_3.6H_2O$ | | | | 98.3 | | | | 125.7 |
| B | $CaS_2O_3.6H_2O + Ca(NO_3)_2.4H_2O$ | | 224.9 | | 26.9 | | 245.5 | | 74.7 |
| C | $Ca(NO_3)_2.4H_2O$ | | 233.5 | | | | 311.1 | | |
| D | $Ca(NO_3)_2.4H_2O + NaNO_3$ | 63.49 | 241.2 | | | 72.7 | 328.8 | | |
| E | $NaNO_3$ | 170.6 | | | | 194.7 | | | |
| F | $NaNO_3 + Na_2S_2O_3.5H_2O$ | 86.62 | | 98.7 | | 98.8 | | 153.0 | |
| G | $Na_2S_2O_3.5H_2O$ | | | 139.10 | | | | 175.4 | |
| H | $CaS_2O_3.6H_2O + Na_2S_2O_3.5H_2O$ | | | 97.4 | 63.6 | | | 139.03 | 97.3 |
| P | $CaS_2O_3.6H_2O + Na_2S_2O_3.5H_2O + Na_2S_2O_3.CaS_2O_3.NaNO_3.11H_2O$ | 20.7 | | 91.4 | 70.2 | 33.2 | | 135.3 | 111.3 |
| Q | $Na_2S_2O_3.5H_2O + NaNO_3 + Na_2S_2O_3.CaS_2O_3.NaNO_3.11H_2O$ | 96.2 | | 82.2 | 30.4 | 75.16 | | 131.5 | 70.48 |
| R | $NaNO_3 + CaS_2O_3.6H_2O + Na_2S_2O_3.CaS_2O_3.NaNO_3.11H_2O$ | 123.1 | 39.2 | | 76.3 | 108.0 | | 61.3 | 112.2 |
| S | $Ca(NO_3)_2.4H_2O + CaS_2O_3.6H_2O + NaNO_3$ | 62.6 | 224.9 | | 46.40 | 79.1 | 263.6 | | 81.8 |

**$S_2O_3^{--}$ $Ca^{++}$ $Na^+$ (237)**: $H_2O + CaS_2O_3 + Na_2S_2O_3$

| Solid phases | Liquid phase | | | |
|---|---|---|---|---|
| | $t$ = 9°C | | $t$ = 25°C | |
| | % $CaS_2O_3$ | % $Na_2S_2O_3$ | % $CaS_2O_3$ | % $Na_2S_2O_3$ |
| $CaS_2O_3.6H_2O$ | 29.34 | | 34.68 | |
| $CaS_2O_3.6H_2O + Na_2S_2O_3.5H_2O$ | 15.84 | 25.21 | 20.33 | 30.19 |
| $Na_2S_2O_3.5H_2O$ | | 37.89 | | 43.51 |

**$S_2O_6^{--}$ $NH_4^+$ $Cu^{++}$**: $H_2O + (NH_4)_2S_2O_6 + CuS_2O_6$
$t$ = 30°C (15)

| % $(NH_4)_2S_2O_6$ | % $CuS_2O_6$ | % $(NH_4)_2S_2O_6$ | % $CuS_2O_6$ |
|---|---|---|---|
| $(NH_4)_2S_2O_6.\frac{1}{2}H_2O$ | | $(NH_4)_2S_2O_6.2CuS_2O_6.$- | |
| 64.6 | 0.0 | $8H_2O + CuS_2O_6.4H_2O$ | |
| 52.62 | 10.45 | 18.39 | 36.19 |
| $(NH_4)_2S_2O_6.\frac{1}{2}H_2O +$ | | $CuS_2O_6.4H_2O$ | |
| $(NH_4)_2S_2O_6.2CuS_2O_6.8H_2O$ | | 16.16 | 37.26 |
| 38.30 | 24.17 | 8.91 | 41.06 |
| $(NH_4)_2S_2O_6.2CuS_2O_6.8H_2O$ | | 0.0 | 45.51 |
| 29.28 | 29.70 | | |
| 18.50 | 36.04 | | |

### $S_2O_6^{--}$ $Ba^{++}$ $Na^+$ (15): $H_2O + BaS_2O_6 + Na_2S_2O_6$

| Solid phases | Liquid phase | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 12°C | | $t$ = 20°C | | $t$ = 30°C | |
| | % $BaS_2O_6$ | % $Na_2S_2O_6$ | % $BaS_2O_6$ | % $Na_2S_2O_6$ | % $BaS_2O_6$ | % $Na_2S_2O_6$ | % $BaS_2O_6$ | % $Na_2S_2O_6$ |
| $BaS_2O_6.2H_2O$ | 7.86 | 0.0 | 12.45 | 0.0 | 15.75 | 0.0 | 19.76 | 0.0 |
| | 7.45 | 2.74 | 11.05 | 6.95 | 13.81 | 6.63 | 17.06 | 6.36 |
| $BaS_2O_6.2H_2O + Na_2S_2O_6.2H_2O$ | 5.86 | 6.23 | 10.76 | 9.27 | 12.66 | 11.02 | 14.46* | 13.10* |
| $Na_2S_2O_6.2H_2O$ | 2.51 | 6.94 | 7.57 | 9.82 | 7.45 | 12.12 | 13.23 | 13.31 |
| | 0.0 | 6.05 | 0.0 | 10.63 | 0.0 | 13.39 | 7.32 | 14.87 |
| | | | | | | | 0.0 | 17.32 |

* Average of four results.

### $S_2O_6^{--}$ $NH_4^+$ $Sr^{++}$

$H_2O + (NH_4)_2S_2O_6 + SrS_2O_6$

$t$ = 30°C (15)

| % $(NH_4)_2S_2O_6$ | % $SrS_2O_6$ |
|---|---|
| $SrS_2O_6.4H_2O$ | |
| 0.0 | 14.90 |
| 16.55 | 10.73 |
| 24.52 | 8.79 |
| 34.57 | 6.47 |
| 45.04 | 4.45 |
| 49.54 | 3.75 |
| 56.51 | 2.77 |
| 56.76 | 2.71 |
| $SrS_2O_6.4H_2O + (NH_4)_2S_2O_6.\frac{1}{2}H_2O$ | |
| 60.66 | 2.17 |
| $(NH_4)_2S_2O_6.\frac{1}{2}H_2O$ | |
| 63.73 | 0.98 |
| 64.60 | 0.0 |

### $S_2O_6^{--}$ $NH_4^+$ $Ba^{++}$

$H_2O + (NH_4)_2S_2O_6 + BaS_2O_6$

$t$ = 30°C (15)

| % $BaS_2O_6$ | % $(NH_4)_2S_2O_6$ |
|---|---|
| $BaS_2O_6.2H_2O$ | |
| 19.76 | 0.0 |
| 17.20 | 11.00 |
| 11.21 | 33.62 |
| 10.26 | 37.26 |
| 8.31 | 37.90 |
| 6.92 | 40.15 |
| 5.28 | 43.22 |
| 2.75 | 48.45 |
| 1.14 | 53.66 |

### $S_2O_6^{--}$ $NH_4^+$ $Ba^{++}$.—(*Cont'd*)

| % $BaS_2O_6$ | % $(NH_4)_2S_2O_6$ |
|---|---|
| $BaS_2O_6.2H_2O$ | |
| 1.05 | 53.81 |
| 0.62 | 56.26 |
| 0.35 | 58.64 |
| $(NH_4)_2S_2O_6.\frac{1}{2}H_2O$ | |
| 0.0 | 64.60 |

### $S_2O_6^{--}$ $Mg^{++}$ $Ba^{++}$ (15)

$H_2O + MgS_2O_6 + BaS_2O_6$

| $t$ = 20°C | | $t$ = 30°C | |
|---|---|---|---|
| % $BaS_2O_6$ | % Mg-$S_2O_6$ | % Ba-$S_2O_6$ | % Mg-$S_2O_6$ |
| $BaS_2O_6.2H_2O$ | | | |
| 15.75 | 0.0 | 19.86 | 0.0 |
| 10.61 | 6.93 | 13.37 | 7.05 |
| 1.29 | 31.14 | 5.85 | 18.91 |
| | | 1.92 | 29.16 |
| $BaS_2O_6.2H_2O + MgS_2O_6.6H_2O$ | | | |
| 0.69 | 33.95 | 0.90 | 34.57 |
| $MgS_2O_6.6H_2O$ | | | |
| 0.0 | 33.91 | 0.0 | 35.24 |

### $S_2O_6^{--}$ $Sr^{++}$ $Na^+$

$H_2O + SrS_2O_6 + Na_2S_2O_6$

$t$ = 30°C (15)

| % $Na_2S_2O_6$ | % $SrS_2O_6$ |
|---|---|
| $SrS_2O_6.4H_2O$ | |
| 0.0 | 14.90 |
| 6.91 | 12.24 |
| $SrS_2O_6.4H_2O + Na_2S_2O_6.2H_2O$ | |
| 13.06 | 10.09 |
| $Na_2S_2O_6.2H_2O$ | |
| 14.52 | 5.55 |
| 17.32 | 0.0 |

### $SeO_3^{--}$ $Hg^{++}$ $Na^+$

$H_2O + HgSeO_3 + Na_2SeO_3$

$t$ = 25°C (317)

| $M_{Na_2SeO_3}$/l | $M_{HgSeO_3}$/l |
|---|---|
| $HgSeO_3$* | |
| 2.0 | 0.0835 |
| 1.0 | 0.0425 |
| 0.5 | 0.0214 |
| 0.25 | 0.0161 |
| 0.125 | 0.0097 |
| 0.0625 | 0.0055 |

* Assuming that the complex $Hg(SeO_3)_2$ is formed, the writers calculate that $Hg(SeO_3)_2 \div (SeO_3)$ gives a constant for the first three concentrations of $Na_2SeO_3$ given in the table.

### $SeO_4^{--}$ $CrO_4^{--}$

$H_2O + H_2SeO_4 + H_2CrO_4$

$t$ = 23°C (264)

| % $H_2SeO_4$ | % $CrO_3$ |
|---|---|
| $CrO_3$ | |
| 50.33 | 8.65 |
| 81.07 | 0.16 |
| 87.64 | 0.29 |
| 96.03 | 0.17 |
| 98.15 | 0.35 |

### $SeO_4^{--}$ $Be^{++}$ (= $Gl^{++}$)

$H_2O + BeO + BeSeO_4$

$t$ = 25°C (362.5)

Gives data for solubility of $BeSeO_4.4H_2O$ in solutions containing varying concentrations of BeO.

### $HSeO_4^-$ $HTeO_4^-$ $Rb^+$

$H_2O + RbHSeO_4 + RbHTeO_4$

$t$ = 25°C (298)

| Solid phase—solid soln., M% $RbHSeO_4$ | Liquid phase | |
|---|---|---|
| | g $RbHSeO_4$/l | g $RbHTeO_4$/l |
| 51.55 | 76.46 | 39.505 |
| 52.22 | 95.82 | 35.300 |
| 53.95 | 171.70 | 22.98 |
| 56.33 | 462.80 | 5.00 |
| 67.46 | 859.30 | 3.40 |

### $N_3^-$ $NO_3^-$ $Pb^{++}$ $Na^+$ (227)

$H_2O + Pb(N_3)_2 + NaNO_3$

| °C | g $Pb(N_3)_2$/l | g $NaNO_3$/l |
|---|---|---|
| $Pb(N_3)_2$ | | |
| 18 | 0.232 | 0.0 |
| 18 | 0.247 | 340.0 |
| 70 | 0.9012 | 0.0 |
| 70 | 4.87 | 340.0 |

### $N_3^-$ $C_2H_3O_2^-$ $Pb^{++}$ $Na^+$ (227)

$H_2O + Pb(N_3)_2 + NaC_2H_3O_2$

| °C | g $Pb(N_3)_2$/l | g $NaC_2H_3O_2$/l |
|---|---|---|
| $Pb(N_3)_2$ | | |
| 18 | 0.232 | 0.0 |
| 18 | 15.42 | 328.0 |
| 80 | 20.20 | 328.0 |

### $NO_2^-$ $Ag^+$ $Ca^{++}$

$H_2O + AgNO_2 + Ca(NO_2)_2$

$t$ = 14°C (293); *v.* Fig. 139

g per 100g $H_2O$*

| $Ca(NO_2)_2$ | $AgNO_2$ |
|---|---|
| $Ca(NO_2)_2 + AgNO_2$ | |
| 92.4 | 11.2 |

* Author does not give further numerical data but a number of points on a diagram (Fig. 139).

### $NO_2^-$ $Ag^+$ $Sr^{++}$

$H_2O + AgNO_2 + Sr(NO_2)_2$

$t$ = 14°C (293); *v.* Fig. 140

g per 100g $H_2O$*

| $AgNO_2$ | $Sr(NO_2)_2$ |
|---|---|
| $Sr(NO_2)_2 + AgNO_2$ | |
| 10.9 | 78.3 |

* Author does not give further numerical data, but a number of additional points on a diagram (Fig. 140).

### $S_2O_6^{--}$ $Ba^{++}$ $K^+$ (15): $H_2O + BaS_2O_6 + K_2S_2O_6$

| Solid phases | Liquid phase | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 20°C | | $t$ = 30°C | |
| | % $BaS_2O_6$ | % $K_2S_2O_6$ | % $BaS_2O_6$ | % $K_2S_2O_6$ | % $BaS_2O_6$ | % $K_2S_2O_6$ |
| $BaS_2O_6.2H_2O$ | 7.86 | 0.0 | 15.75 | 0.0 | 19.86 | 0.0 |
| | 8.02 | 1.21 | 16.43 | 2.69 | 20.64 | 4.16 |
| $BaS_2O_6.2H_2O + K_2S_2O_6$ | 8.88 | 2.75 | 17.15 | 6.03 | 20.69 | 8.03 |
| $K_2S_2O_6$ | 4.69 | 2.60 | 11.82 | 6.02 | 20.50 | 8.11 |
| | 0.0 | 2.52 | 0.0 | 6.23 | 11.74 | 8.33 |
| | | | | | 6.02 | 8.49 |
| | | | | | 0.0 | 8.54 |

### $NO_2^-$ $NO_3^-$ $Na^+$ (293): $H_2O + NaNO_2 + NaNO_3$

| Solid phases | Liquid phase—g per 100g $H_2O$ | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 21°C | | $t$ = 52°C | | $t$ = 65°C | | $t$ = 81°C | | $t$ = 92°C | | $t$ = 103°C | |
| | $NaNO_3$ | $NaNO_2$ | $NaNO_3$ | $NaNO_2$ | $NaNO_3$ | $NaNO_2$ | $NaNO_3$ | $NaNO_2$ | $NaNO_3$ | $NaNO_2$ | $NaNO_3$ | $NaNO_2$ | $NaNO_3$ | $NaNO_2$ |
| | 0.0 | 73.0 | 0.0 | 84.75 | 0.0 | 108.8 | 0.0 | 120.7 | 0.0 | 137.1 | 0.0 | 149.7 | 0.0 | 166.0 |
| | 19.0 | 68.5 | 9.6 | 81.1 | 6.7 | 107.9 | 34.8 | 111.5 | 38.8 | 125.7 | 23.6 | 141.2 | 33.2 | 153.3 |
| $NaNO_2$ | 36.3 | 67.1 | 23.5 | 79.7 | 20.6 | 104.3 | 62.8 | 108.5 | 69.8 | 122.7 | 57.6 | 134.6 | 58.8 | 148.8 |
| | | | 50.8 | 73.8 | 34.5 | 101.8 | | | | | | | | |
| | | | | | 43.2 | 99.5 | | | | | | | | |
| | | | | | 62.6 | 98.0 | | | | | | | | |
| $NaNO_2 + NaNO_3$ | 41.7 | 64.9 | 54.5 | 73.1 | 82.0 | 97.8 | 90.6 | 107.8 | 101.0 | 122.6 | 107.8 | 132.3 | 116.0 | 142.4 |
| | 46.8 | 50.3 | 56.7 | 64.2 | 88.0 | 65.2 | 96.0 | 78.3 | 111.5 | 79.1 | 130.6 | 60.2 | 126.8 | 100.0 |
| | 55.4 | 30.2 | 62.8 | 46.8 | 92.9 | 44.2 | 104.1 | 49.5 | 121.0 | 50.0 | 145.0 | 30.3 | 142.9 | 60.1 |
| $NaNO_3$ | 74.2 | 0.0 | 74.7 | 21.6 | 101.4 | 27.2 | 113.4 | 28.4 | 131.7 | 27.2 | 163.5 | 0.0 | 181.2 | 0.0 |
| | | | 89.3 | 0.0 | 109.0 | 14.7 | 121.4 | 14.7 | 150.0 | 0.0 | | | | |
| | | | | | 118.0 | 0.0 | 131.0 | 0.0 | | | | | | |

### $NO_2^-$ $Ag^+$ $Ba^{++}$

$H_2O + AgNO_2 + Ba(NO_2)_2$

$t$ = 13.5° C(293)

*v.* Fig. 141

g per 100g $H_2O$*

| $Ba(NO_2)_2$ | $AgNO_2$ |
|---|---|
| $AgNO_2 + 2AgNO_2.Ba(NO_2)_2.H_2O$ | |
| 64.0 | 10.2 |
| $2AgNO_2.Ba(NO_2)_2.H_2O + Ba(NO_2)_2$ | |
| 75.6 | 9.5 |

* Author does not give further numerical data but a number of points on a diagram (Fig. 141).

### $NO_2^-$ $Ag^+$ $Li^+$

$H_2O + AgNO_2 + LiNO_2$

$t$ = 14°C (293)

*v.* Fig. 142

g per 100g $H_2O$*

| $LiNO_2$ | $AgNO_2$ |
|---|---|
| $LiNO_2 + AgNO_2$ | |
| 78.5 | 10.5 |

* Author does not give further numerical data but a number of points on a diagram (Fig. 142).

### $NO_2^-$ $Ag^+$ $Na^+$ (293)

$H_2O + AgNO_2 + NaNO_2$; *v.* Fig. 143

| Solid phases | Liquid phase—g per 100g $H_2O$* | | | |
|---|---|---|---|---|
| | $t$ = 14°C | | $t$ = 22°C | |
| | $NaNO_2$ | $AgNO_2$ | $NaNO_2$ | $AgNO_2$ |
| $AgNO_2 + 2AgNO_2.2NaNO_2.H_2O$ | 55.0 | 15.2 | 58.3 | 21.5 |
| $2AgNO_2.2NaNO_2.H_2O + NaNO_2$ | 74.5 | 11.3 | 78.3 | 13.4 |

* Author does not give further numerical data but several additional points on a diagram (Fig. 143).

### $NO_2^-$ $Ag^+$ $K^+$ (293)

$H_2O + AgNO_2 + KNO_2$; *v.* Fig. 144

| Solid phases | Liquid phase—g per 100g $H_2O$* | | | |
|---|---|---|---|---|
| | $t$ = 13.5°C | | $t$ = 25°C | |
| | $KNO_2$ | $AgNO_2$ | $KNO_2$ | $AgNO_2$ |
| $AgNO_2 + 2AgNO_2.2KNO_2.H_2O$ | 18.0 | 2.36 | 23.1 | 5.3 |
| $2AgNO_2.2KNO_2.H_2O + KNO_2$ | 276.0 | 26.3 | 279.0 | 39.3 |

* Author does not give further numerical data but a number of points on a diagram (Fig. 144).

### $NO_2^-$ $Ag^+$ $K^+$.—(*Continued*)

$t$ = 25°C (91)

| $M_{KNO_2}$/1 | $M_{AgNO_2}$/1 |
|---|---|
| $AgNO_2$ | |
| 0.000 | 0.0269 |
| 0.00258 | 0.0259 |
| 0.00588 | 0.0249 |
| 0.01177 | 0.0232 |
| 0.02355 | 0.0203 |
| 0.04710 | 0.0181 |

### $NO_3^-$ $NH_4^+$ (154)

$H_2O + HNO_3 + NH_4NO_3$

| °C | % $NH_4NO_3$ | % $HNO_3$ |
|---|---|---|
| | $NH_4NO_3.2HNO_3$ | |
| −8 | 34.2 | 53.9 |
| −2.5 | 34.8 | 54.8 |
| +3.0 | 35.4 | 55.8 |
| 8.5 | 36.0 | 56.8 |
| 19.5 | 37.4 | 58.9 |
| 25.0 | 38.1 | 60.0 |
| 29.5* | 38.8 | 61.2 |

### $NO_3^-$ $NH_4^+$.—(*Continued*)

$t$ = 20°C (278)

| % $NH_4NO_3$ | % $HNO_3$ |
|---|---|
| $NH_4NO_3$ | |
| 65.64 | 0.0 |
| 60.04 | 3.98 |
| 55.95 | 8.81 |
| 51.17 | 14.65 |
| 46.35 | 21.46 |
| 43.35 | 28.33 |

* Melting point.

### $NO_3^-$ $NH_4^+$ $C_2O_4^{--}$ (82)

$H_2O + NH_4NO_3 + (NH_4)_2C_2O_4$

| °C | % $NH_4NO_3$ | % $(NH_4)_2C_2O_4$ |
|---|---|---|
| | $NH_4NO_3 + (NH_4)_2C_2O_4.H_2O$ | |
| 19 | 62.26 | 0.085 |
| 50 | 72.11 | 0.35 |

### $NO_3^-$ $NH_4^+$ $HCO_3^-$ (125)

$H_2O + NH_4NO_3 + NH_4HCO_3$

| Solid phases | Liquid phase—g per 1000g $H_2O$ | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 15°C | | $t$ = 30°C | |
| | $NH_4NO_3$ | $NH_4HCO_3$ | $NH_4NO_3$ | $NH_4HCO_3$ | $NH_4NO_3$ | $NH_4HCO_3$ |
| | | 0 119 | | 186.4 | | 0 269.6 |
| | | | 232.6 | 129.10 | | |
| $NH_4HCO_3$ | | | 498.20 | 103.30 | | |
| | | | 1034 | 82.50 | | |
| | | | 1189 | 77.9 | | |
| $NH_4HCO_3 + NH_4NO_3$ | 1180 | 45.20 | 1669 | 74.6 | 2319 | 125.70 |

### $NO_3^-$ $NH_4^+$ $Ag^+$ (348): $H_2O + NH_4NO_3 + AgNO_3$

| °C | Solid phases | Liquid phase | |
|---|---|---|---|
| | | % $NH_4NO_3$ | % $AgNO_3$ |
| 30 | $NH_4NO_3$ | 70.1 | 0 |
| | | 63.59 | 12.51 |
| | | 58.64 | 21.37 |

*Continued on p. 358*

$NO_3^-$ $NH_4^+$ $HCO_3^-$ $Na^+$ (125): $H_2O + NH_4HCO_3 + NaNO_3$; *v.* Fig. 145

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 0°C | | | | $t$ = 15°C | | | | $t$ = 30°C | | | |
| | | $NaHCO_3$ | $NH_4NO_3$ | $NaNO_3$ | $NH_4HCO_3$ | $NaHCO_3$ | $NH_4NO_3$ | $NaNO_3$ | $NH_4HCO_3$ | $NaHCO_3$ | $NH_4NO_3$ | $NaNO_3$ | $NH_4HCO_3$ |
| A | $NaHCO_3$ | 14.94 | | | | 18.9 | | | | 23.60 | | | |
| B | $NaHCO_3 + NaNO_3$ | 3.06 | | 153.9 | | 3.42 | | 176 | | 3.78 | | 201.4 | |
| C | $NaNO_3$ | | | 155.2 | | | | 177.5 | | | | 203.4 | |
| D | $NaNO_3 + NH_4NO_3$ | | 237.24 | 138.6 | | | 349.3 | 159.48 | | | 496.4 | 186.8 | |
| E | $NH_4NO_3$ | | 266.2 | | | | 376.4 | | | | 523.1 | | |
| F | $NH_4NO_3 + NH_4HCO_3$ | | 265.3 | | 10.26 | | 375.3 | | 16.9 | | 521.5 | | 28.6 |
| G | $NH_4HCO_3$ | | | | 27.00 | | | | 42.5 | | | | 61.38 |
| H | $NH_4HCO_3 + NaHCO_3$ | 10.44 | | | 25.00 | 12.8 | | | 38.9 | 15.5 | | | 58.14 |
| L | $NH_4NO_3 + NH_4HCO_3 + NaHCO_3$ | 11.70 | 256.3 | 52.94 | | 19.26 | 376.9 | 51.5 | | 34.6 | 538.9 | 45.2 | |
| M | $NH_4NO_3 + NaNO_3 + NaHCO_3$ | 4.68 | 237.6 | 134.3 | | 7.2 | 352.3 | 153.7 | | 11.9 | 505.3 | 173.7 | |

$NO_3^-$ $NH_4^+$ $Ag^+$.—(*Continued from p. 357*)

| °C | Solid phases | Liquid phase % $NH_4NO_3$ | Liquid phase % $AgNO_3$ |
|---|---|---|---|
| 30 | $NH_4NO_3 + NH_4NO_3.AgNO_3$ | 52.50 | 29.76 |
| | $NH_4NO_3.AgNO_3$ | 45.44 | 35.62 |
| | | 39.60 | 41.09 |
| | | 34.47 | 45.85 |
| | | 28.86 | 52.45 |
| | | 24.33 | 57.93 |
| | $NH_4NO_3.AgNO_3 + AgNO_3$ | 23.43 | 58.89 |
| | $AgNO_3$ | 15.62 | 63.27 |
| | | 6.59 | 69.08 |
| | | 0 | 73.00 |
| − 7.3 | Ice + $AgNO_3$* | 0 | 47.10 |
| − 10.7 | $AgNO_3$* | 8.43 | 44.52 |
| − 14.9 | Ice + $NH_4NO_3.AgNO_3$ + $AgNO_3$* | 16.80 | 42.00 |
| − 14.8 | Ice + $NH_4NO_3.AgNO_3$ | 18.79 | 39.51 |
| − 18.7 | Ice + $NH_4NO_3.AgNO_3$ + $NH_4NO_3\beta$ | 37.30 | 15.99 |
| − 17.4 | Ice + $NH_4NO_3$ | 41.20 | 0 |
| 0 | $NH_4NO_3.AgNO_3$ + $AgNO_3$* | 19.59 | 50.36 |
| + 18 | | 22.06 | 55.36 |
| 55 | | 26.12 | 63.32 |
| 109.6 | | 32.10 | 67.90 |
| 0 | $NH_4NO_3.AgNO_3$ + $NH_4NO_3\beta$ | 44.87 | 22.13 |
| 18 | | 49.22 | 26.07 |
| 40 | $NH_4NO_3.AgNO_3$ + $NH_4NO_3\alpha$ | 52.22 | 32.68 |
| 55 | | 52.38 | 36.60 |
| 101.5 | $NH_4NO_3.AgNO_3$ + $NH_4NO_3$† | 52.50 | 47.50 |

* Rhombic. † Rhombohedral.

$NO_3^-$ $NH_4^+$ $Cu^{++}$: $H_2O + NH_4NO_3 + Cu(NO_3)_2$
$t$ = 30.5°C (262)

| % $Cu(NO_3)_2$ | % $NH_4NO_3$ | % $Cu(NO_3)_2$ | % $NH_4NO_3$ |
|---|---|---|---|
| $Cu(NO_3)_2.3H_2O$ | | $NH_4NO_3$ | |
| 60.2 | 0.0 | 37.5 | 38.3 |
| 59.7 | 1.6 | 34.9 | 40.4 |
| 58.9 | 3.9 | 31.7 | 41.0 |
| 55.1 | 11.5 | 29.2 | 42.2 |
| 52.4 | 19.0 | 20.8 | 49.3 |
| 49.9 | 25.2 | 6.5 | 62.8 |
| $Cu(NO_3)_2.3H_2O + NH_4NO_3$ | | 0.0 | 70.6 |
| 46.0 | 36.4 | | |

$NO_3^-$ $NH_4^+$ $Cu^{++}$.—(*Continued*)

| Solid phases (356) | Liquid phase $t$ = 30°C % $Cu(NO_3)_2$ | Liquid phase $t$ = 30°C % $NH_4NO_3$ | Liquid phase $t$ = 40°C % $Cu(NO_3)_2$ | Liquid phase $t$ = 40°C % $NH_4NO_3$ |
|---|---|---|---|---|
| | 61 | | 62.6 | |
| $Cu(NO_3)_2.\frac{5}{2}H_2O$ | 55.8 | 12.75 | 56.9 | 11.9 |
| | 50.0 | 27.41 | 50.7 | 24.1 |
| | | | 48.1 | 36.4 |
| $Cu(NO_3)_2.\frac{5}{2}H_2O + Cu(NO_3)_2.3NH_4NO_3$ | 45.04* | 39.00* | 47.9 | 36.7 |
| | | | 48.00 | 36.7 |
| $Cu(NO_3)_2.3NH_4NO_3$ | | | 45.9 | 39.2 |
| | | | 43.9 | 41.7 |
| $Cu(NO_3)_2.3NH_4NO_3 + NH_4NO_3$ | 43.9 | 40.6 | 42.0 | 43.9 |
| | 43.01 | 38.24 | 36.8 | 43.6 |
| | 38.07 | 38.35 | 28.4 | 47.5 |
| $NH_4NO_3$ | 33.96 | 39.95 | 14.17 | 58.4 |
| | 26.37 | 44.82 | 8.2 | 65.2 |
| | 9.80 | 59.95 | | 75.0 |
| | | 71.18 | | |

* Mean of two results.

$NO_3^-$ $NH_4^+$ $Al^{+++}$
$H_2O + NH_4OH + NH_4NO_3 + Al(OH)_3$
$t$ = 20°C (12)

| M $NH_4OH$/l | % $NH_4NO_3$ | g $Al(OH)_3$/l $Al(OH)_3.?H_2O$ |
|---|---|---|
| 1.0 | 5.0 | 0.187 |
| 1.0 | 10.0 | 0.082 |
| 1.0 | 20.0 | 0.045 |
| 1.0 | 30.0 | 0.035 |
| 0.50 | 5.0 | 0.145 |
| 0.50 | 10.0 | 0.012 |
| $t$ = 30°C | | |
| 1.0 | 5.0 | 0.143 |
| 1.0 | 10.0 | 0.066 |
| 0.50 | 5.0 | 0.080 |
| 0.5 | 10.0 | 0.009 |

$NO_3^-$ $NH_4^+$ $Al^{+++}$ $K^+$
$H_2O + NH_4OH + NH_4NO_3 + Al(OH)_3 + KNO_3$
$t$ = 20°C (12)

| M $NH_4OH$/l | % $KNO_3$ | g $Al(OH)_3$/l $Al(OH)_3.?H_2O$ |
|---|---|---|
| 1.0 | 5.0 | 0.760 |
| 1.0 | 10.0 | 1.310 |
| 0.5 | 5.0 | 0.450 |
| 0.5 | 10.0 | 0.485 |
| $t$ = 30°C | | |
| 1.0 | 5.0 | 1.12 |
| 1.0 | 10.0 | 1.32 |
| 0.5 | 5.0 | 0.713 |
| 0.5 | 10.0 | 1.033 |

**$NO_3^-$ $NH_4^+$ $Na^+$ (125)**
$H_2O + NH_4NO_3 + NaNO_3$

| Solid phases | Liquid phase—g per 100g $H_2O$ | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 15°C | | $t$ = 30°C | |
| | $NH_4NO_3$ | $NaNO_3$ | $NH_4NO_3$ | $NaNO_3$ | $NH_4NO_3$ | $NaNO_3$ |
| | 0 | 73.33 | 24.03 | 81.21 | 0 | 96.12 |
| $NaNO_3$ | | | 42.81 | 79.34 | | |
| | | | 64.60 | 78.06 | | |
| | | | 110.90 | 75.81 | | |
| | | | 152.00 | 75.35 | | |
| $NaNO_3 + NH_4NO_3$ | 105.50 | 66.00 | 155.30 | 75.38 | 220.80 | 88.31 |
| | 118.40 | 0 | 156.10 | 60.76 | 232.60 | 0 |
| $NH_4NO_3$ | | | 159.00 | 36.50 | | |
| | | | 160.00 | 27.79 | | |
| | | | 162.30 | 17.63 | | |
| | | | 167.40 | 0 | | |

**$NO_3^-$ $NH_4^+$ $K^+$ (52)**
$H_2O + NH_4NO_3 + KNO_3$
$t$ = 17°C (52); *v.* Fig. 146

| | Solid phases | Liquid phase—g per 100g $H_2O$ | |
|---|---|---|---|
| | | $NH_4NO_3$ | $KNO_3$ |
| A | $NH_4NO_3$ | 179.3 | 0.0 |
| | Solid soln. I* | 182.0 | 4.88 |
| B | Solid soln. I* + Solid soln. II† | 184.0 | 8.55 |
| | Solid soln. II† | 161.5 | 26.40 |
| | | 156.5 | 33.3 |
| C | Solid soln. II† + Solid soln. III‡ | 143.0 | 43.5 |
| | Solid soln. III‡ | 111.4 | 39.3 |
| | | 69.3 | 32.7 |
| | | 44.9 | 29.4 |
| | | 24.9 | 27.5 |
| | | 20.1 | 26.7 |
| | | 9.62 | 26.4 |
| | | 3.93 | 26.9 |
| D | $KNO_3$ | 0.0 | 28.0 |

* Solid soln. I contains from 100 to 97.4 % $NH_4NO_3$.
† Solid soln. II contains from 93.1 to 49.2 % $NH_4NO_3$.
‡ Solid soln. III contains from 14 to 0 % $NH_4NO_3$.

$t$ = 25°C (6)

| Solid phases | M % $NH_4NO_3$ | Liquid phase | |
|---|---|---|---|
| | | % $NH_4NO_3$ | % $KNO_3$ |
| $KNO_3$ | 0 | 0.0 | 27.86 |
| | 2.29 | 13.48 | 23.53 |
| Solid soln. I* | 4.60 | 25.56 | 21.38 |
| | 9.73 | 39.45 | 19.27 |
| Solid soln. I* + Solid soln. II† | 36.43 | 51.16 | 16.90 |
| | 45.92 | 51.57 | 16.92 |
| | 65.65 | 51.56 | 16.69 |
| | 73.85 | 54.80 | 13.95 |
| Solid soln. II† | 85.09 | 59.93 | 8.62 |
| | 88.49 | 61.42 | 7.26 |
| | 95.96 | 65.63 | 2.71 |
| $NH_4NO_3$ | | 67.70 | 0.0 |

* Solid soln. I varies from 0 to 13.5 % $NH_4NO_3$.
† Solid soln. II from 65 to 100 % $NH_4NO_3$.

**$NO_3^-$ $BiO^+$: $H_2O + HNO_3 + Bi(OH)_3$**
$t$ = 25°C (363)

| $M_{Bi}$/l | $M_{NO_3}$/l | $M_{Bi}$/l | $M_{NO_3}$/l |
|---|---|---|---|
| $BiONO_3.H_2O$ | | | |
| 0.002713 | 0.1027 | 0.09956 | 0.6969 |
| 0.01449 | 0.2168 | 0.1592 | 0.9537 |
| 0.04944 | 0.4485 | 0.2354 | 1.2547 |

**$NO_3^-$ $CO_3^{--}$ $Na^+$ (238): $H_2O + NaNO_3 + Na_2CO_3$**

| Solid phases | Liquid phase | | | |
|---|---|---|---|---|
| | $t$ = 10°C | | $t$ = 24.2°C | |
| | % $Na_2CO_3$ | % $NaNO_3$ | % $Na_2CO_3$ | % $NaNO_3$ |
| $Na_2CO_3.10H_2O$ | 10.70 | | 2.77 | |
| $Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$ | | | 15.29 | 26.67 |
| $Na_2CO_3.7H_2O$ | | | 13.76 | 30.39 |
| $Na_2CO_3.7H_2O + NaNO_3$ | | | 11.80 | 34.01 |
| $NaNO_3$ | | | 3.13 | 44.67 |
| | | 44.60 | | 48.30 |
| $NaNO_3.Na_2CO_3.10H_2O$ | 4.88 | 39.32 | | |

**$NO_3^-$ $CO_3^{--}$ $Na^+$ $K^+$**; *v.* p. 360

**$NO_3^-$ $CO_3^{--}$ $K^+$ (238): $H_2O + KNO_3 + K_2CO_3$**

| Solid phases | Liquid phase | | | |
|---|---|---|---|---|
| | $t$ = 10°C | | $t$ = 24.2°C | |
| | % $K_2CO_3$ | % $KNO_3$ | % $K_2CO_3$ | % $KNO_3$ |
| $K_2CO_3.\frac{3}{2}H_2O$ | 52.01 | | 52.95 | |
| $K_2CO_3.\frac{3}{2}H_2O + KNO_3$ | 51.17 | 1.27 | 51.89 | 1.45 |
| | | | 45.81 | 2.02 |
| | | | 39.07 | 4.15 |
| $KNO_3$ | | | 24.56 | 9.37 |
| | | | 23.07 | 10.72 |
| | | | 9.21 | 20.14 |
| | | 17.28 | | 27.36 |

**$NO_3^-$ $C_2O_4^{--}$ $Ag^+$**
$H_2O + HNO_3 + Ag_2C_2O_4$
$t$ = 25°C (185)

| % $HNO_3$ | % $Ag_2C_2O_4$ |
|---|---|
| $Ag_2C_2O_4$ | |
| 1.572 | 0.1334 |
| 3.110 | 0.2149 |
| 5.995 | 0.3599 |
| 11.390 | 0.6735 |
| 22.036 | 1.4993 |
| 29.095 | 2.4974 |
| 30.219 | 2.7857 |

**$NO_3^-$ $C_2O_4^{--}$ $La^{+++}$**
$H_2O + La(NO_3)_3 + La_2(C_2O_4)_3$
$t$ = 25°C (222)

| % $La_2(C_2O_4)_3$ | % $La(NO_3)_3$ |
|---|---|
| $La_2(C_2O_4)_3.8H_2O$ | |
| 0.28 | 5.06 |
| 0.88 | 14.04 |
| 1.46 | 22.15 |
| 2.01 | 28.63 |
| 2.41 | 34.61 |

**$NO_3^-$ $C_2O_4^{--}$ $La^{+++}$.—(*Cont'd*)**

| % $La_2(C_2O_4)_3$ | % $La(NO_3)_3$ |
|---|---|
| $La_2(C_2O_4)_3.8H_2O$ | |
| 2.59 | 36.24 |
| 2.67 | 37.42 |
| 3.00 | 39.89 |
| $La_2(C_2O_4)_3.8H_2O + La_2(C_2O_4)_3.5H_2O$ | |
| 3.32 | 42.27 |
| $La_2(C_2O_4)_3.5H_2O + La_2(C_2O_4)_3.3H_2O$ | |
| 2.68 | 45.26 |
| $La_2(C_2O_4)_3.3H_2O$ | |
| 2.64 | 46.39 |
| 2.52 | 51.30 |
| 2.41 | 54.11 |
| 2.32 | 56.54 |
| $La_2(C_2O_4)_3.3H_2O + La(NO_3)_3$ | |
| 2.23 | 59.03 |
| $La(NO_3)_3$ | |
| 2.10 | 59.03 |
| 0.67 | 59.91 |
| 0 | 60.17 |

$NO_3^-$ $CO_3^{--}$ $Na^+$ $K^+$ (219, 238)

$H_2O + NaNO_3 + K_2CO_3$; *v.* Fig. 147

| | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 10°C | | | | $t$ = 24.2°C; *v.* Fig. 147† | | | |
| | | 0.5-$K_2CO_3$ | $KNO_3$ | 0.5-$Na_2CO_3$ | $NaNO_3$ | 0.5-$K_2CO_3$ | $KNO_3$ | 0.5-$Na_2CO_3$ | $NaNO_3$ |
| A | $Na_2CO_3.10H_2O$ | | | 40.64 | | | | 96.88 | |
| B | $Na_2CO_3.10H_2O$ | | | | | | | 89.35 | 97.24 |
| | $Na_2CO_3.10H_2O + NaNO_3$ | | | 29.69 | 150.10 | | | | |
| C | $Na_2CO_3.10H_2O + NaNO_3$ | | | | | | | 72.47 | 132.12 |
| D | $NaNO_3$ | | | | 170.28 | | | | 193.28* |
| E | $NaNO_3 + KNO_3$ | | 53.89 | | 178.16 | | 77.62* | | 215.14* |
| F | $KNO_3$ | | 74.37 | | | | 66.96* | | |
| G | $KNO_3 + K_2CO_3.\frac{3}{2}H_2O$ | | 280.08 | | 4.74 | 289.44 | 5.508 | | |
| H | $K_2CO_3.\frac{3}{2}H_2O$ | 282.17 | | | | 293.0 | | | |
| I | $K_2CO_3.\frac{3}{2}H_2O + KNaCO_3.6H_2O$ | 273.96 | | 20.76 | | 279.57 | | 38.09 | |
| | $NaNO_3 + KNO_3 + Na_2CO_3.10H_2O$ | | 38.48 | 22.28 | 161.24 | | | | |
| J | $KNaCO_3.6H_2O + Na_2CO_3.10H_2O$ | | | | | 62.48* | | 129.12* | |
| P | $K_2CO_3.\frac{3}{2}H_2O + KNO_3 + KNaCO_3.6H_2O$ | | | | | 264.17 | 11.23 | 26.42 | |
| Q | $KNO_3 + Na_2CO_3.10H_2O + KNaCO_3.6H_2O$ | 4.802 | 25.40 | 54.46 | | 3.31 | 42.19 | 130.46 | |
| R | $Na_2CO_3.10H_2O + KNO_3 + NaNO_3$ | | | | | | 50.4 | 73.98 | 149.94 |
| | $KNaCO_3.6H_2O + K_2CO_3.\frac{3}{2}H_2O + KNO_3$ | 266.68 | 2.57 | 17.93 | | | | | |

* By graphical interpolation. † Data for system $Na_2CO_3.10H_2O + Na_2CO_3.7H_2O + KNO_3$ lacking.

$NH_4^+$ $HCO_3^-$ $Na^+$ (124, 125, 279)

$H_2O + NH_4HCO_3 + NaHCO_3$

| Solid phases | Liquid phase—g per 100g $H_2O$ (125) | | | | | | Liquid phase (279) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 15°C | | $t$ = 30°C | | $t$ = 15°C | | $t$ = 30°C* | | $t$ = 40°C* | |
| | $NaHCO_3$ | $NH_4HCO_3$ | $NaHCO_3$ | $NH_4HCO_3$ | $NaHCO_3$ | $NH_4HCO_3$ | % $NaHCO_3$ | % $NH_4HCO_3$ | % $NaHCO_3$ | % $NH_4HCO_3$ | % $NaHCO_3$ | % $NH_4HCO_3$ |
| $NaHCO_3$ | 6.90 | | 8.80 | | 11.03 | | 7.93 | | | | | |
| | | | 8.00 | 2.30 | | | 7.26 | 1.99 | | | | |
| | | | 7.46 | 4.40 | | | 6.67 | 3.93 | | | | |
| | | | 6.69 | 8.57 | | | 5.79 | 7.44 | | | | |
| $NaHCO_3 + NH_4HCO_3$ | 4.82 | 10.94 | 5.93 | 17.06 | 7.21 | 25.57 | 4.82 | 13.88 | 4.72 | 13.61 | 5.34 | 22.45 |

* Under the pressure of $CO_2 + NH_3$ due to decomposition of the $NH_4HCO_3$ in the solution.

$NH_4^+$ $HCO_3^-$ $Na^+$.—(*Cont'd.*)

$t$ = 35°C† (124)

| % $NaHCO_3$ | % $NH_4HCO_3$ |
|---|---|
| $NH_4HCO_3$ | |
| 0.0 | 24.02 |
| $NH_4HCO_3 + NaHCO_3$ | |
| 5.14 | 21.55 |
| $NaHCO_3$ | |
| 5.45 | 21.28 |
| 8.06 | 8.29 |
| 9.19 | 3.49 |
| 10.38 | 0.0 |

† Under pressure of 3 atm. of $CO_2$.

$NO_3^-$ $C_2O_4^{--}$ $Na^+$ (82)

$H_2O + NaNO_3 + Na_2C_2O_4$

| °C | % $NaNO_3$ | % $Na_2C_2O_4$ |
|---|---|---|
| $NaNO_3 + Na_2C_2O_4.H_2O$ | | |
| 15 | 45.86 | 0.051 |
| 50 | 53.06 | 0.047 |

$NO_3^-$ $C_2O_4^{--}$ $K^+$ (82)

$H_2O + KNO_3 + K_2C_2O_4$

| °C | % $KNO_3$ | % $K_2C_2O_4$ |
|---|---|---|
| $KNO_3 + K_2C_2O_4.H_2O$ | | |
| 19 | 11.6 | 20.38 |
| 50 | 28.29 | 19.63 |

$NO_3^-$ $C_2H_3O_2^-$ $Ag^+$

$H_2O + HC_2H_3O_2 + AgNO_3$

$t$ = 25°C (185)

| % $HNO_3$ | % $AgC_2H_3O_2$ |
|---|---|
| $AgC_2H_3O_2$ | |
| 0.0 | 1.1074 |
| 2.850 | 7.9580 |
| 5.258 | 14.201 |
| 8.904 | 24.262 |
| 14.021 | 37.367 |
| 15.844 | 42.024 |
| 17.773 | 47.437 |

$NO_3^-$ $C_2H_2ClO_2^-$ $Ag^+$

$H_2O + HC_2H_2ClO_2 + AgNO_3$

$t$ = 25°C (185)

| % $HNO_3$ | % $AgC_2H_2ClO_2$ |
|---|---|
| $AgC_2H_2ClO_2$ | |
| 0.0 | 1.504 |
| 1.488 | 4.827 |
| 2.833 | 8.510 |
| 5.234 | 14.582 |
| 8.883 | 24.441 |
| 13.983 | 37.229 |
| 15.751 | 42.059 |

$NO_3^-$ $HC_4H_4O_6^-$ $K^+$

$H_2O + KNO_3 + KHC_4H_4O_6$

$t$ = 24°C (283)

| $M_{KNO_3}$/1* | $M_{KHC_4H_4O_6}$/1* |
|---|---|
| $KHC_4H_4O_6$ | |
| 0 | 0.0347 |
| 0.05 | 0.01953 |
| 0.10 | 0.01355 |
| 0.20 | 0.00901 |

* Data mean of two results.

$NO_3^-$ $Pb^{++}$ $Cu^{++}$

$H_2O + Pb(NO_3)_2 + Cu(NO_3)_2$

$t$ = 20°C (123)

| g per 100g $H_2O$ | |
|---|---|
| $Cu(NO_3)_2$ | $Pb(NO_3)_2$ |
| $Pb(NO_3)_2$ | |
| 0.0 | 55.11 |
| 7.72 | 39.34 |
| 15.04 | 27.80 |
| 24.63 | 19.05 |
| 33.25 | 14.70 |
| 37.96 | 13.08 |
| 60.32 | 8.19 |
| 83.11 | 5.37 |
| 100.29 | 3.53 |

| $Pb(NO_3)_2 + Cu(NO_3)_2.6H_2O$ | |
|---|---|
| 127.70 | 2.33 |

| $Cu(NO_3)_2.6H_2O$ | |
|---|---|
| 127.40 | 0 |

**$NO_3^-$ $Pb^{++}$ $Ba^{++}$ (129)**
$H_2O + Pb(NO_3)_2 + Ba(NO_3)_2$

| Solid phase | | Liquid phase—M per 1000M $H_2O$ | |
|---|---|---|---|
| M % $Ba(NO_3)_2$ | M % $Pb(NO_3)_2$ | $Ba(NO_3)_2$ | $Pb(NO_3)_2$ |
| | $t$ = 15°C | | |
| 25.10 | 74.90 | 2.726 | 23.14 |
| 81.31 | 18.69 | 4.126 | 7.80 |
| 86.95 | 13.05 | 4.610 | 4.836 |
| | $t$ = 30°C | | |
| 3.06 | 96.94 | 0.669 | 34.96 |
| 14.50 | 85.50 | 2.213 | 32.21 |
| 31.22 | 68.78 | 3.249 | 28.61 |
| 63.61 | 36.39 | 5.050 | 18.91 |
| 65.70 | 34.30 | 4.916 | 18.38 |
| 81.90 | 18.10 | 5.916 | 10.64 |
| 91.67 | 8.33 | 6.419 | 4.781 |
| | $t$ = 47°C | | |
| 10.81 | 89.19 | 1.958 | 41.05 |
| 16.74 | 83.26 | 2.831 | 40.10 |
| 28.32 | 71.68 | 3.820 | 36.40 |
| 87.52 | 12.48 | 8.854 | 9.234 |

**$NO_3^-$ $Pb^{++}$ $Ba^{++}$,—(*Continued*)**

| Solid phase—g per 100g solid (148) | | Liquid phase | |
|---|---|---|---|
| $Ba(NO_3)_2$ | $Pb(NO_3)_2$ | % $Ba(NO_3)_2$ | % $Pb(NO_3)_2$ |
| | $t$ = 25°C | | |
| 12.46 | 87.54 | 1.59 | 34.60 |
| 23.44 | 76.56 | 2.65 | 31.13 |
| 60.73 | 39.27 | 4.23 | 22.73 |
| 84.56 | 15.44 | 6.66 | 8.96 |
| 89.58 | 10.42 | 7.31 | 6.26 |
| 96.41 | 3.59 | 8.64 | 1.63 |
| | $t$ = 50°C | | |
| 11.69 | 88.31 | 2.57 | 40.82 |
| 30.98 | 69.02 | 3.83 | 37.78 |
| 58.75 | 41.25 | 6.32 | 29.31 |
| 91.22 | 8.78 | 11.05 | 10.34 |
| 93.33 | 6.67 | 12.68 | 5.72 |

**$NO_3^-$ $Pb^{++}$ $K^+$ (149): $H_2O + Pb(NO_3)_2 + KNO_3$**

| Solid phases | Liquid phase | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 25°C | | $t$ = 50°C | | $t$ = 100°C | |
| | % $Pb(NO_3)_2$ | % $KNO_3$ | % $Pb(NO_3)_2$ | % $KNO_3$ | % $Pb(NO_3)_2$ | % $KNO_3$ |
| $Pb(NO_3)_2$ | 37.17 | | 44.79 | | 55.65 | |
| | | | | | 44.50 | 36.90 |
| $Pb(NO_3)_2 + KNO_3$ | 41.93 | 24.67 | 42.14 | 33.14 | | |
| $KNO_3$ | | 27.39 | | 45.51 | | 71.10 |

**$NO_3^-$ $Pb^{++}$ $Ba^{++}$ $K^+$ (148)**
$H_2O + Pb(NO_3)_2 + Ba(NO_3)_2 + KNO_3$

| Solid phases | Liquid phase | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 25°C | | | $t$ = 50°C | | |
| | % $KNO_3$ | % $Pb(NO_3)_2$ | % $Ba(NO_3)_2$ | % $KNO_3$ | % $Pb(NO_3)_2$ | % $Ba(NO_3)_2$ |
| $Ba(NO_3)_2.2KNO_3$* | 15.26 | 2.12 | 6.05 | 27.40 | 15.89 | 8.11 |
| | 17.39 | 11.44 | 3.40 | 28.28 | 27.00 | 5.68 |
| | 16.01 | 21.25 | 4.33 | 32.61 | 38.93 | 2.15 |
| | 17.87 | 35.90 | 2.46 | | | |
| | 23.41 | 37.68 | 2.11 | | | |
| $Ba(NO_3)_2.2KNO_3$* + $KNO_3$ | 25.75 | 34.65 | 1.16 | | | |
| $Ba(NO_3)_2.2KNO_3 + KNO_3$ | 25.74 | 32.63 | 1.92 | 35.48 | 33.62 | 2.01 |
| | 26.78 | 23.26 | 1.76 | 36.91 | 29.22 | 2.24 |
| | 27.23 | 15.28 | 2.32 | 38.06 | 24.98 | 2.59 |
| | 27.69 | 9.85 | 1.87 | 39.43 | 19.96 | 2.85 |
| | 27.74 | 4.95 | 1.92 | 40.90 | 14.64 | 3.32 |
| | | | | 41.39 | 13.01 | 3.44 |
| | | | | 41.86 | 10.35 | 3.69 |
| $Ba(NO_3)_2.2KNO_3$* + $KNO_3$ | 25.22 | 40.46 | 0.72 | 33.25 | 40.88 | 1.02 |
| | 25.0 | 39.84 | 1.18 | 33.41 | 40.19 | 1.51 |
| | 25.0 | 38.0 | 1.59 | 32.64 | 39.82 | 2.40 |
| | 24.91 | 37.48 | 1.80 | | | |

* Contained small amounts of $Pb(NO_3)_2.2KNO_3$.

**$NO_3^-$ $Pb^{++}$ $Na^+$ (149)**
$H_2O + Pb(NO_3)_2 + NaNO_3$; *v.* Fig. 148

| | Solid phases | Liquid phase | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 0°C | | $t$ = 25°C | | $t$ = 50°C | | $t$ = 100°C | |
| | | % $Pb(NO_3)_2$ | % $NaNO_3$ | % $Pb(NO_3)_2$ | % $NaNO_3$ | % $Pb(NO_3)_2$ | % $NaNO_3$ | % $Pb(NO_3)_2$ | % $NaNO_3$ |
| A | $Pb(NO_3)_2$ | 28.70 | | 37.17 | | 44.79 | | 55.65 | |
| B | $Pb(NO_3)_2$ | 25.80 | 2.91 | 27.86 | 10.04 | 29.22 | 17.51 | 50.78 | 4.24 |
| C | $Pb(NO_3)_2 + NaNO_3$ | | | 15.47 | 40.32 | 17.25 | 43.84 | | |
| D | $NaNO_3$ | | | | 47.86 | | 53.29 | | |

**$NO_3^-$ $Pb(N_3)_2$ $Na^+$; *v.* p. 356**

### $NO_3^-$ $Tl^+$ $K^+$: $H_2O + TlNO_3 + KNO_3$; $t = 25°C$ (129)

| Solid phases | M% $KNO_3$ | M% $TlNO_3$ | Liquid phase—M per l $KNO_3$ | $TlNO_3$ |
|---|---|---|---|---|
| Solid soln. I* | 100.00 | 0.00 | 3.4682 | 0.00 |
| | 99.92 | 0.08 | 3.2515 | 0.0089 |
| | 99.80 | 0.20 | 3.2851 | 0.0231 |
| | 99.43 | 0.57 | 3.2981 | 0.0663 |
| | 98.22 | 1.78 | 3.2944 | 0.1869 |
| | 97.81 | 2.19 | 3.1724 | 0.2390 |
| | 97.23 | 2.77 | 3.2658 | 0.3238 |
| Solid solns. I + II | | | 4.2326 | 0.4652 |
| Solid soln. II† | 6.67 | 93.33 | 2.4233 | 0.3806 |
| | 0.00 | 100.00 | 0.00 | 0.4361 |

* Solid solution I from 100 to 94 % $KNO_3$. † Solid solution II from 72.96 to 0 % $KNO_3$.

### $NO_3^-$ $Zn^{++}$ $Nd^{+++}$ (301)
$H_2O + Zn(NO_3)_2 + Nd(NO_3)_3$

| °C | % $Nd_2O_3$ | % ZnO | % double salt |
|---|---|---|---|
| $2Nd(NO_3)_3.3Zn(NO_3)_2.24H_2O$ | | | |
| 15 | 14.0 | 10.15 | 69.1 |
| 30 | 14.88 | 10.79 | 73.5 |
| 50 | 15.86 | 11.53 | 78.3 |
| 70 | 17.15 | 12.33 | 84.6 |

### $NO_3^-$ $Zn^{++}$ $Pr^{+++}$ (301)
$H_2O + Zn(NO_3)_2 + Pr(NO_3)_3$

| °C | % $Pr_2O_3$ | % ZnO | % double salt |
|---|---|---|---|
| $2Pr(NO_3)_3.3Zn(NO_3)_2.24H_2O$ | | | |
| 15 | 13.22 | 9.87 | 66.3 |
| 30 | 14.08 | 10.45 | 70.6 |
| 45 | 15.02 | 11.01 | 75.4 |
| 60 | 15.97 | 11.98 | 80.1 |

### $NO_3^-$ $Cu^{++}$: $H_2O + HNO_3 + Cu(NO_3)_2$; $t = 15°C$ (305)

| % $HNO_3$ | % $Cu(NO_3)_2$ | Solid phase |
|---|---|---|
| 0.0 | 52.40 | $Cu(NO_3)_2.3H_2O$ |
| 5.00 | 48.00 | |
| 10.00 | 44.00 | |

### $NO_3^-$ $Hg^+$
$H_2O + HNO_3 + HgNO_3$; $t = 25°C$ (89)

| Solid phases | Liquid phase $M_{HNO_3}$/l | $M_{Hg}$/l |
|---|---|---|
| $HgNO_3.H_2O + 3HgNO_3.Hg_2O.H_2O$ | 2.955 | 2.150 |
| $3HgNO_3.Hg_2O.H_2O$ | 1.356 | 0.923 |
| $3HgNO_3.Hg_2O.H_2O + HgNO_3.Hg_2O$ | 0.293 | 0.239 |
| $HgNO_3.Hg_2O$ | 0.1579 | 0.1321 |
| $HgNO_3.Hg_2O + HgNO_3.Hg_2O.\frac{3}{2}H_2O$ | 0.102 | 0.0807 |
| $HgNO_3.Hg_2O.\frac{3}{2}H_2O$ | 0.0068 | |
| $HgNO_3.Hg_2O.\frac{3}{2}H_2O + Hg_2O$ | 0.0016 | |

### $NO_3^-$ $Hg^{++}$ (89): $H_2O + HNO_3 + HgO$

| Solid phases | Liquid phase $t = 15°C$ $M_{HNO_3}$/l | $M_{Hg}$/l | $t = 25°C$ $M_{HNO_3}$/l | $M_{Hg}$/l | $t = 50°C$ $M_{HNO_3}$/l | $M_{Hg}$/l |
|---|---|---|---|---|---|---|
| $Hg(NO_3)_2.H_2O + Hg(NO_3)_2.2HgO$ | 17.93 | 8.172 | 18.71 | 8.585 | | |
| | | | 16.52 | 8.235 | | |
| | | | 9.65 | 4.515 | | |
| $Hg(NO_3)_2.2HgO$ | | | 1.35 | 0.6182 | | |
| | | | 0.646 | 0.2958 | | |
| | | | 0.283 | 0.1252 | | |
| | | | 0.123m | 0.0545m | | |
| $Hg(NO_3)_2.2HgO + HgO$ | 0.136 | 0.058 | 0.154 | 0.0675 | 0.284 | 0.1226 |
| HgO | 0.1156 | 0.0499 | 0.116 | 0.0494 | 0.231 | |
| | 0.0723 | 0.0303 | 0.072 | 0.0306 | 0.1156 | 0.0494 |
| | | | | | 0.0723 | |

### $NO_3^-$ $Cu^{++}$ $Ag^+$ (305): $H_2O + Cu(NO_3)_2 + AgNO_3$

| Solid phases | Liquid phase $t = 0°C$ % $Cu(NO_3)_2$ | % $AgNO_3$ | $t = 10°C$ % $Cu(NO_3)_2$ | % $AgNO_3$ | $t = 15°C$ % $Cu(NO_3)_2$ | % $AgNO_3$ | $t = 20°C$ % $Cu(NO_3)_2$ | % $AgNO_3$ | $t = 30°C$ % $Cu(NO_3)_2$ | % $AgNO_3$ | $t = 100°C$ % $Cu(NO_3)_2$ | % AgNO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $AgNO_3$ | | 55.60 | | 63.60 | | 66.70 | | 68.30 | | 74.10 | | 90.00 |
| $AgNO_3 + Cu(NO_3)_2.6H_2O$ | 40.90 | 12.10 | 40.00 | 12.50 | 47.60 | 12.10 | 51.10 | 11.60 | | | | |
| $AgNO_3 + Cu(NO_3)_2.3H_2O$ | | | | | | | | | 54.80 | 11.80 | 54.00 | 25.50 |
| $Cu(NO_3)_2.6H_2O$ | 46.30 | | 50.30 | | 52.40 | | 55.40 | | | | | |
| $Cu(NO_3)_2.3H_2O$ | | | | | | | | | 60.90 | | 71.50 | |

### $NO_3^-$ $Cu^{++}$ $Na^+$
$H_2O + Cu(NO_3)_2 + NaNO_3$
$t = 20°C$ (255)

| % $Cu(NO_3)_2$ | % $NaNO_3$ |
|---|---|
| $Cu(NO_3)_2.6H_2O$ | |
| 55.94 | 0.0 |
| 55.76 | 2.07 |
| 54.34 | 4.29 |
| $Cu(NO_3)_2.6H_2O + NaNO_3$ | |
| 53.30 | 5.27 |
| $NaNO_3$ | |
| 46.32 | 8.19 |
| 29.25 | 19.89 |
| 3.38 | 43.51 |
| 0.0 | 48.60 |
| $NaNO_3 + Cu(NO_3)_2.3H_2O$ | |
| 56.57m | 5.66m |
| $Cu(NO_3)_2.3H_2O$ | |
| 57.0m | 3.59m |
| 57.0m | 1.98m |

### $NO_3^-$ $Ag^+$
$H_2O + HNO_3 + AgNO_3$
$t = 30°C$ (256)

| % $HNO_3$ | % $AgNO_3$ |
|---|---|
| $AgNO_3$ | |
| 0.0 | 73.22 |
| 1.119 | 69.87 |
| 2.854 | 64.64 |
| 5.51 | 57.27 |
| 10.47 | 45.09 |
| 18.91 | 29.37 |
| 26.59 | 20.32 |
| 40.33 | 10.36 |
| 56.48 | 4.22 |
| $t = 15°C$ (305) | |
| $AgNO_3$ | |
| 0 | 66.65 |
| 5 | 50.50 |
| 10 | 38.30 |

### $NO_3^-$ $Mn^{++}$ $Pr^{+++}$ (301)
$H_2O + Mn(NO_3)_2 + Pr(NO_3)_3$

| °C | % $Pr_2O_3$ | % MnO | % double salt |
|---|---|---|---|
| $2Pr(NO_3)_3.3Mn(NO_3)_2.24H_2O$ | | | |
| 15 | 14.60 | 9.44 | 71.8 |
| 30 | 15.42 | 9.75 | 75.9 |
| 45 | 16.24 | 10.40 | 79.9 |
| 60 | 17.43 | 11.15 | 85.8 |

### $NO_3^-$ $Mn^{++}$ $Nd^{+++}$ (301)
$H_2O + Mn(NO_3)_2 + Nd(NO_3)$

| °C | % MnO | % $Nd_2O_3$ | % double salt |
|---|---|---|---|
| $2Nd(NO_3)_3.3Mn(NO_3)_2.24H_2O$ | | | |
| 15 | 9.50 | 15.24 | 73.8 |
| 30 | 10.15 | 15.99 | 77.4 |
| 45 | 10.68 | 17.05 | 82.6 |
| 60 | 11.48 | 18.37 | 89.0 |

### $NO_3^-$ $Fe^{+++}$: $H_2O + HNO_3 + Fe_2O_3$

| | Solid phases $t = 25°C$ (67); *v.* Fig. 149 | Liquid phase % $Fe_2O_3$ | % $N_2O_5$ |
|---|---|---|---|
| A | Probably basic salts | 2.86 | 4.03 |
| B | | 10.86 | 19.58 |
| C | | 15.22 | 30.50 |
| D | $Fe_2O_3.3N_2O_5.18H_2O$ | 9.95 | 36.30 |
| E | | 6.11 | 42.70 |
| F | | 5.02 | 47.50 |
| G | $Fe_2O_3.4N_2O_5.18H_2O$ | 3.93 | 47.20 |
| H | | 3.52 | 49.60 |
| I | $Fe_2O_3.3N_2O_5.18H_2O$ | 4.49m | 55.20m |

**$NO_3^-$ $Co^{++}$ $Pr^{+++}$ (301)**

$H_2O + Co(NO_3)_2 + Pr(NO_3)_3$

| °C | % CoO | % $Pr_2O_3$ | % double salt |
|---|---|---|---|
| $2Pr(NO_3)_3.3Co(NO_3)_2.24H_2O$ | | | |
| 15 | 9.30 | 13.64 | 67.6 |
| 30 | 9.75 | 14.28 | 70.8 |
| 45 | 10.13 | 14.98 | 74.3 |
| 60 | 10.79 | 15.89 | 78.8 |

**$NO_3^-$ $Co^{++}$ $Nd^{+++}$ (301)**

$H_2O + Co(NO_3)_2 + Nd(NO_3)_3$

| °C | % CoO | % $Nd_2O_3$ | % double salt |
|---|---|---|---|
| $2Nd(NO_3)_3.3Co(NO_3)_2.24H_2O$ | | | |
| 15 | 9.28 | 14.0 | 68.3 |
| 30 | 9.84 | 14.84 | 72.4 |
| 45 | 10.43 | 15.71 | 76.6 |
| 60 | 11.16 | 16.63 | 81.1 |

**$NO_3^-$ $Ni^{++}$ $Pr^{+++}$ (301)**

$H_2O + Ni(NO_3)_2 + Pr(NO_3)_3$

| °C | % NiO | % $Pr_2O_3$ | % double salt |
|---|---|---|---|
| $2Pr(NO_3)_3.3Ni(NO_3)_2.24H_2O$ | | | |
| 15 | 8.83 | 12.99 | 64.4 |
| 30 | 9.41 | 13.83 | 68.5 |
| 45 | 9.87 | 14.50 | 71.8 |
| 60 | 10.47 | 15.27 | 75.7 |

**$NO_3^-$ $Ni^{++}$ $Nd^{+++}$ (301)**

$H_2O + Ni(NO_3)_2 + Nd(NO_3)_3$

| °C | % NiO | % $Nd_2O_3$ | % double salt |
|---|---|---|---|
| $2Nd(NO_3)_3.3Ni(NO_3)_2.24H_2O$ | | | |
| 15 | 9.13 | 14.01 | 68.4 |
| 30 | 9.73 | 14.66 | 71.5 |
| 45 | 10.12 | 15.41 | 75.10 |
| 60 | 10.89 | 16.36 | 79.80 |

**$NO_3^-$ $CrO_4^{--}$ (276)**

$H_2O + HNO_3 + H_2CrO_4$

| $t$ = 25°C; *v.* Fig. 150 | | $t$ = 45°C | |
|---|---|---|---|
| % $HNO_3$ | % $CrO_3$ | % $HNO_3$ | % $CrO_3$ |
| | | $CrO_3$ | |
| 0.0 | 62.85 | 0.0 | 63.50 |
| 13.25 | 48.10 | 5.58 | 57.93 |
| 26.79 | 34.32 | 19.53 | 43.41 |
| 46.91 | 14.63 | 50.69 | 13.15 |
| 68.49 | 0.95 | 73.81 | 0.88 |
| 82.90 | 0.06 | 88.35 | 0.60 |
| 89.17 | 0.18 | 88.06 | 9.42 |
| 91.36 | 8.29 | | |

**$NO_3^-$ $UO_2^{++}$**

$H_2O + HNO_3 + UO_2(NO_3)_2$

$t$ = 25°C (84.5)

| % $HNO_3$ | % $UO_2(NO_3)_2$ |
|---|---|
| | $UO_2(NO_3)_2.6H_2O$ |
| 0 | 56.08 |
| 12.35 | 40.36 |
| 25.14 | 30.29 |
| 28.67 | 29.65 |
| 29.84 | 31.27 |
| $UO_2(NO_3)_2.6H_2O + UO_2(NO_3)_2.3H_2O$ | |
| 30.43 | 36.77 |
| | $UO_2(NO_3)_2.3H_2O$ |
| 31.15 | 37.99 |
| 32.31 | 36.28 |
| 46.12 | 27.18 |
| 50.43 | 25.79 |
| 53.20 | 26.77 |
| $UO_2(NO_3)_2.3H_2O + UO_2(NO_3)_2.2H_2O$ | |
| 53.71 | 27.49 |
| | $UO_2(NO_3)_2.2H_2O$ |
| 55.24 | 27.24 |
| 60.38 | 23.65 |
| 66.71 | 22.29 |
| 68.83 | 22.49 |

**$NO_3^-$ $UO_2^{++}$ $K^+$**

$H_2O + HNO_3 + UO_2(NO_3)_2 + KNO_3$

$t$ = 20°C (278)

| % $HNO_3$ | % $KNO_3.UO_2(NO_3)_2$ |
|---|---|
| | $KNO_3$ |
| 0.0 | 46.09 |
| 5.50 | 45.05 |
| 10.01 | 49.95 |
| | $UO_2(NO_3)_2.6H_2O$ |
| 15.85 | 47.09 |
| | $KNO_3.UO_2(NO_3)_2$ |
| 15.83 | 47.23 |
| 22.06 | 44.84 |
| 32.47 | 35.06 |
| 44.81 | 25.32 |
| % $HNO_3$ | % $2KNO_3.UO_2(NO_3)_2$ |
| | $KNO_3$ |
| 0.0 | 38.61 |
| 6.57 | 34.30 |
| 13.73 | 31.37 |
| 19.77 | 34.12 |
| 23.92 | 40.19 |
| $2KNO_3.UO_2(NO_3)_2$ | |
| 32.83 | 34.34 |
| $KNO_3.UO_2(NO_3)_2$ | |
| 31.75 | 36.51 |

**$NO_3^-$ $Al^{+++}$ (272)**

$H_2O + HNO_3 + Al(NO_3)_3$

| °C | % $HNO_3$ | % $Al(NO_3)_3$ |
|---|---|---|
| | | $Al(NO_3)_3.9H_2O$ |
| 4 | 19.75 | 19.65 |
| 5 | 50.65 | 1.50 |
| 5 | 70.65 | 0.23 |
| 19.8 | 15.45 | 27.10 |
| 20 | 46.05 | 5.86 |
| 20 | 71.35 | 0.73 |
| 40 | 11.95 | 34.60 |
| 40 | 38.50 | 16.30 |
| 40 | 44.80 | 13.05 |
| 40 | 64.50 | 4.15 |
| 40 | 65.35 | 4.14 |
| 60 | 4.93 | 44.35 |
| 60 | 17.15 | 36.40 |
| 60 | 18.90 | 36.00 |
| 60 | 32.65 | 29.10 |

$t$ = 25°C (215)

| % $Al(NO_3)_3$ | % $HNO_3$ |
|---|---|
| | $Al(NO_3)_3.9H_2O$ |
| 38.87 | 0.33 |
| 32.16 | 9.15 |
| 17.57 | 28.65 |
| 5.05 | 47.08 |
| 1.84 | 58.26 |
| 1.42 | 60.43 |
| 1.25 | 71.15 |
| | $Al(NO_3)_3.8H_2O$ |
| 1.25 | 72.06 |
| 0.71 | 75.34 |
| 0.24 | 80.28 |
| | $Al(NO_3)_3.6H_2O$ |
| 0.17 | 81.08 |
| 0.17 | 87.66 |
| 0.25 | 89.02 |
| 0.43 | 90.12 |

**$NO_3^-$ $Al^{+++}$ $K^+$ (408)**

$H_2O + Al(NO_3)_3 + KNO_3$

**$NO_3^-$ $Mg^{++}$ $Pr^{+++}$ (301)**

$H_2O + Mg(NO_3)_2 + Pr(NO_3)_3$

| °C | % MgO | % $Pr_2O_3$ | % double salt |
|---|---|---|---|
| $2Pr(NO_3)_3.3Mg(NO_3)_2.24H_2O$ | | | |
| 15 | 4.97 | 13.55 | 63.0 |
| 30 | 5.24 | 14.29 | 66.4 |
| 50 | 5.55 | 15.27 | 71.0 |
| 70 | 6.14 | 16.65 | 77.5 |

**$NO_3^-$ $Mg^{++}$ $Nd^{+++}$ (301)**

$H_2O + Mg(NO_3)_2 + Nd(NO_3)_3$

| °C | % MgO | % $Nd_2O_3$ | % double salt |
|---|---|---|---|
| $2Nd(NO_3)_3.3Mg(NO_3)_2.24H_2O$ | | | |
| 15 | 5.17 | 14.45 | 66.0 |
| 30 | 5.49 | 15.20 | 69.5 |
| 50 | 5.78 | 16.34 | 74.4 |
| 70 | 6.29 | 17.47 | 79.8 |

**$NO_3^-$ $Mg^{++}$ $Na^+$**

$H_2O + Mg(NO_3)_2 + NaNO_3$

$t$ = 25°C (217)

| % $Mg(NO_3)_2$ | % $NaNO_3$ |
|---|---|
| | $Mg(NO_3)_2.6H_2O$ |
| 43.25 | 0 |
| 40.84 | 3.37 |
| 40.0 | 5.12 |
| $Mg(NO_3)_2.6H_2O + NaNO_3$ | |
| 38.25 | 9.22 |
| | $NaNO_3$ |
| 34.24 | 11.10 |
| 25.25 | 18.26 |
| 9.82 | 36.58 |
| 0 | 47.60 |

**$NO_3^-$ $Ca^{++}$ (27)**

$H_2O + HNO_3 + Ca(OH)_2$

$t$ = 25°C*

| % CaO | % $N_2O_5$ |
|---|---|
| | $CaO.H_2O$ |
| 0.1150 | 0 |
| 5.590 | 10.53 |
| 10.48 | 19.87 |
| 13.87 | 26.25 |
| 15.50 | 29.28 |
| | $2CaO.N_2O_5.3H_2O$ |
| 15.75 | 29.83 |
| 16.56 | 31.49 |
| 18.35 | 35.05 |
| 18.93 | 36.21 |
| | $CaO.N_2O_5.4H_2O$ |
| 19.76 | 38.01 |
| 19.80 | 38.18 |

$t$ = 100°C

| | |
|---|---|
| | $CaO.H_2O$ |
| 0.0561 | 0 |
| 5.37 | 10.13 |
| 14.92 | 27.82 |
| 19.63 | 35.38 |
| 20.51 | 36.63 |
| $CaO.H_2O + 2CaO.N_2O_5.2H_2O$ | |
| 21.13 | 37.50 |
| | $2CaO.N_2O_5.2H_2O$ |
| 21.63 | 38.62 |
| 22.00 | 39.79 |
| 23.77 | 43.75 |
| 24.76 | 45.50 |
| $2CaO.N_2O_5.2H_2O + 2CaO.N_2O_5.\frac{1}{2}H_2O$ | |
| 25.38 | 46.47 |
| | $2CaO.N_2O_5.\frac{1}{2}H_2O$ |
| 25.51 | 47.03 |
| 26.18 | 48.61 |
| 26.73 | 49.86 |
| | $CaO.N_2O_5$ |
| 27.33 | 51.09 |
| 26.98 | 51.17 |

* Cameron and Robinson (63) found as solid phases at 25°C, $CaO.H_2O$, a solid solution, $2CaO.N_2O_5.\frac{1}{2}H_2O$ and $CaO.N_2O_5.4H_2O$.

**$NO_3^-$ $Ca^{++}$ $Na^+$ (237, 297)**
$H_2O + Ca(NO_3)_2 + NaNO_3$

| Solid phases (237) | Liquid phase, $t$ = 9°C: % $Ca(NO_3)_2$ | % $NaNO_3$ | $t$ = 25°C: % $Ca(NO_3)_2$ | % $NaNO_3$ |
|---|---|---|---|---|
| $Ca(NO_3)_2.4H_2O$ | 51.53 | | 58.64 | |
| $Ca(NO_3)_2.4H_2O + NaNO_3$ | 46.08 | 12.56 | 52.73 | 12.08 |
| $NaNO_3$ | | 44.60 | | 47.90 |
| (297) | $t$ = 50°C | | $t$ = 94.5°C | |
| $Ca(NO_3)_2.3H_2O$ | 73.80 | | | |
| $Ca(NO_3)_2.3H_2O + NaNO_3$ | 69.40 | 11.10 | | |
| $Ca(NO_3)_2$ | | | 78.40 | |
| | | | 74.6 | 4.3 |
| | | | 68.9 | 14.3 |
| $Ca(NO_3)_2 + NaNO_3$ | | | 66.7 | 18.0 |
| | 62.70 | 11.50 | 60.2 | 17.8 |
| | 61.3 | 12.2 | 47.0 | 24.7 |
| | 52.3 | 14 9 | 20.5 | 43.9 |
| $NaNO_3$ | 39.2 | 21.0 | | 62.6 |
| | 30.7 | 27.4 | | |
| | 22.6 | 34.5 | | |
| | | 52.80 | | |

**$NO_3^-$ $Ca^{++}$ $K^+$**
$H_2O + Ca(NO_3)_2 + KNO_3$
$t$ = 30°C (19); *v.* Fig. 151

| | Solid phases* | Liquid phase: % $Ca(NO_3)_2$ | % $KNO_3$ | % $H_2O$ |
|---|---|---|---|---|
| A | $Ca(NO_3)_2.4H_2O$ | 59.65 | | 40.35 |
| B | | 57.40 | 13.80 | 28.80 |
| | | 58.90 | 17.20 | 23.90 |
| D | $Ca(NO_3)_2.4H_2O + Ca(NO_3)_2$ ? | 66.00 | 13.00 | 21.00 |
| E | $Ca(NO_3)_2$ ? | 58.30 | 22.40 | 19.30 |
| F | $Ca(NO_3)_2$ ? + $KNO_3$ | 52.00 | 30.40 | 17.60 |
| G | $KNO_3$ | 43.90 | 23.25 | 32.85 |
| H | | 24.70 | 22.50 | 52.80 |
| I | | | 31.40 | 68.60 |

* Owing to the viscosity of the liquid phases here concerned the author was not able to obtain conclusive evidence (1), that $KNO_3$ existed as a stable solid phase from G to F; (2), that $Ca(NO_3)_2$ rather than a hydrated salt existed from F to D; and (3), that $Ca(NO_3)_2.4H_2O$ existed as a stable solid from D to A.

**$NO_3^-$ $Sr^{++}$**
$H_2O + Sr(OH)_2 + Sr(NO_3)_2$
$t$ = 25°C (296)

| g per 100g $H_2O$ | | | |
|---|---|---|---|
| SrO | $Sr(NO_3)_2$ | SrO | $Sr(NO_3)_2$ |
| $Sr(NO_3)_2$ | | $SrO.9H_2O$ | |
| 0.0 | 79.27 | 1.34 | 52.90 |
| 0.78 | 80.83 | 1.14 | 40.83 |
| $Sr(NO_3)_2 + SrO.9H_2O$ | | 1.01 | 28.80 |
| 1.76 | 81.06 | 0.95 | 23.83 |
| $SrO.9H_2O$ | | 0.84 | 12.78 |
| 1.71 | 74.27 | 0.78 | 4.45 |
| 1.51 | 63.71 | | |

**$NO_3^-$ $Sr^{++}$ $K^+$ (127): $H_2O + Sr(NO_3)_2 + KNO_3$**

| Solid phases | Liquid phase, $t$ = 20°C: % $KNO_3$ | % $Sr(NO_3)_2$ | $t$ = 40°C: % $KNO_3$ | % $Sr(NO_3)_2$ |
|---|---|---|---|---|
| $KNO_3$ | 24.27 | 0 | 39.00 | 0 |
| | 22.90 | 5.49 | 30.26 | 23.70 |
| | 21.01 | 17.10 | | |
| | 19.49 | 34.91 | | |
| $KNO_3 + Sr(NO_3)_2.4H_2O$ | 19.69 | 39.56 | | |
| $KNO_3 + Sr(NO_3)_2$ | | | 26.90 | 38.52 |
| $Sr(NO_3)_2.4H_2O$ | 17.56 | 40.37 | | |
| | 12.65 | 41.12 | | |
| | 10.00 | 40.70 | | |
| | 0 | 41.43 | | |
| $Sr(NO_3)_2$ | | | 22.50 | 40.22 |
| | | | 11.19 | 44.19 |
| | | | 0 | 47.70 |

**$NO_3^-$ $Ba^{++}$: $H_2O + HNO_3 + BaO$**

| $t$ = 25°C (295) | | $t$ = 30°C (256) | |
|---|---|---|---|
| g per 100g $H_2O$ | | | |
| BaO | $Ba(NO_3)_2$ | % $Ba(NO_3)_2$ | % $HNO_3$ |
| $Ba(NO_3)_2$ | | $Ba(NO_3)_2$ | |
| 0.0 | 10.30 | 10.25 | 0.0 |
| 1.55 | 10.66 | 8.89 | 0.77 |
| 3.22 | 11.04 | 5.91 | 2.95 |
| $Ba(NO_3)_2 + BaO.H_2O$ | | 4.39 | 4.45 |
| 5.02 | 11.48 | 3.33 | 5.94 |
| $BaO.H_2O$ | | 2.59 | 7.38 |
| 4.93 | 10.21 | 2.08 | 8.82 |
| 4.83 | 8.66 | 1.45 | 11.67 |
| 4.72 | 7.01 | 0.79 | 17.07 |
| 4.55 | 6.82 | 0.50 | 22.14 |
| 4.52 | 4.44 | 0.51 | 22.18 |
| 4.48 | 3.47 | 0.33 | 27.12 |
| 4.42 | 2.53 | | |
| 4.35 | 1.45 | | |
| 4.29 | 0.0 | | |

**$NO_3^-$ $Ba^{++}$ $Na^+$ (87, 88)**
$H_2O + Ba(NO_3)_2 + NaNO_3$

| Solid phases | Liquid phase, $t$ = 0°C: % Ba-$(NO_3)_2$ | % $NaNO_3$ | $t$ = 30°C: % Ba-$(NO_3)_2$ | % $NaNO_3$ |
|---|---|---|---|---|
| $Ba(NO_3)_2$ | 4.74 | | 10.33 | 0.0 |
| | 4.03 | 0.61 | 8.58 | 2.33 |
| | 3.34 | 1.68 | 5.28 | 7.09 |
| | 1.60 | 8.02 | 3.89 | 12.07 |
| | 1.53 | 20.24 | 3.54 | 14.41 |
| | 1.56 | 27.74 | 3.20 | 17.87 |
| | 1.55 | 30.81 | 3.07 | 19.06 |
| | 1.53 | 33.79 | 2.81 | 23.55 |
| | 1.49 | 35.83 | 2.27 | 41.22 |
| $Ba(NO_3)_2 + NaNO_3$ | 1.55* | 41.37* | 2.11 | 48.22 |
| $NaNO_3$ | 0.51 | 41.68 | 1.00 | 48.50 |
| | | 42.47 | | 49.16 |

* Mean of four determinations.

*Continued on p. 365*

**$NO_3^-$ $Ba^{++}$ $K^+$: $H_2O$ + $Ba(NO_3)_2$ + $KNO_3$**

| Solid phases | Liquid phase (127) $t$ = 9.1°C % $Ba(NO_3)_2$ | $t$ = 9.1°C % $KNO_3$ | $t$ = 21.1°C % $Ba(NO_3)_2$ | $t$ = 21.1°C % $KNO_3$ | $t$ = 35°C % $Ba(NO_3)_2$ | $t$ = 35°C % $KNO_3$ |
|---|---|---|---|---|---|---|
| $Ba(NO_3)_2$ | 6.25 | 0 | 8.46 | 0 | 11.39 | 0 |
| | | | 7.47 | 2.12 | 8.18 | 12.99 |
| | | | 6.35 | 5.98 | 8.08 | 17.48 |
| | | | 6.06 | 8.47 | | |
| $Ba(NO_3)_2$ + $Ba(NO_3)_2.2KNO_3$ | 4.20 | 8.15 | 5.98 | 13.24 | 8.42 | 19.75 |
| $Ba(NO_3)_2.2KNO_3$ | 1.98 | 12.02 | 3.35 | 18.24 | 5.85 | 24.00 |
| | | | 2.30 | 21.47 | 5.02 | 26.05 |
| $Ba(NO_3)_2.2KNO_3$ + $KNO_3$ | 0.98 | 16.80 | 1.76 | 24.86 | 3.02 | 34.87 |
| $KNO_3$ | 0 | 16.76 | 0 | 24.77 | 0 | 35.01 |

| Solid phases | Liquid phase (148) $t$ = 25°C % $Ba(NO_3)_2$ | $t$ = 25°C % $KNO_3$ | $t$ = 50°C % $Ba(NO_3)_2$ | $t$ = 50°C % $KNO_3$ |
|---|---|---|---|---|
| $KNO_3$ | 0.0 | 27.39 | 2.34 | 45.45 |
| | | | 4.22 | 44.88 |
| $KNO_3$ + $Ba(NO_3)_2.2KNO_3$ | 2.44 | 27.67 | 5.11 | 44.66 |
| $Ba(NO_3)_2.2KNO_3$ | 4.88 | 17.14 | 5.64 | 40.31 |
| | | | 6.99 | 35.75 |
| | | | 10.16 | 30.08 |
| $Ba(NO_3)_2.2KNO_3$ + $Ba(NO_3)_2$ | 6.60 | 14.80 | 10.81 | 28.86 |
| $Ba(NO_3)_2$ | 6.57 | 9.13 | 10.43 | 24.14 |
| | 7.72 | 3.80 | 10.14 | 18.76 |
| | 9.28 | 0.0 | 10.92 | 10.53 |
| | | | 12.73 | 3.93 |
| | | | 14.67 | 0.0 |

**$NO_3^-$ $Na^+$ $K^+$ (238, 307): $H_2O$ + $NaNO_3$ + $KNO_3$**

| Solid phases | Liquid phase—g per 100g $H_2O$ (307) $t$ = 5°C $KNO_3$ | $t$ = 5°C $NaNO_3$ | $t$ = 25°C $KNO_3$ | $t$ = 25°C $NaNO_3$ | $t$ = 50°C $KNO_3$ | $t$ = 50°C $NaNO_3$ | $t$ = 100°C $KNO_3$ | $t$ = 100°C $NaNO_3$ | Liquid phase (238) $t$ = 10°C % $NaNO_3$ | $t$ = 10°C % $KNO_3$ | $t$ = 24.2°C % $NaNO_3$ | $t$ = 24.2°C % $KNO_3$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $KNO_3$ | 16.83 | | 38.85 | | 85.10 | | 246 | | | 17.28 | | 27.44 |
| | 15.57 | 22.30 | 37.96 | 5 | 87.53 | 57.89 | | | | | 19.96 | 22.45 |
| | | | 37.49 | 10 | | | | | | | 39.57 | 17.93 |
| | | | 37.42 | 15 | | | | | | | | |
| | | | 37.54 | 20 | | | | | | | | |
| | | | 39.39 | 40 | | | | | | | | |
| | | | 41.87 | 60 | | | | | | | | |
| $KNO_3$ + $NaNO_3$ | 18.10 | 82.10 | 46.15 | 100.9 | 90.2 | 134.9 | 218 | 233.6 | 38.98 | 14.04 | 41.50 | 17.77 |
| | | 76.30 | 30 | 97.95 | | 114.1 | | 176 | | 44.60 | 44.76 | 6.08 |
| | | | 20 | 96.06 | | | | | | | 47.74 | |
| $NaNO_3$ | | | 10 | 94.47 | | | | | | | | |
| | | | 5 | 93.39 | | | | | | | | |
| | | | | 91.86 | | | | | | | | |

**$NO_3^-$ $Ba^{++}$ $Na^+$.**—*(Continued from p. 364)*
$t$ = 20°C (126)

| % $NaNO_3$ | % $Ba(NO_3)_2$ | % $NaNO_3$ | % $Ba(NO_3)_2$ |
|---|---|---|---|
| $Ba(NO_3)_2$ | | $NaNO_3$ + $Ba(NO_3)_2$ | |
| 37.07 | 2.07 | 45.74 | 1.86 |
| 14.59 | 2.49 | | |
| 5.61 | 3.89 | | |

**$NO_3^-$ $K^+$ (49, 154, 278); *cf.* (410): $H_2O$ + $HNO_3$ + KOH**

| Solid phases | Liquid phase $t$ = 20°C (49) $M_{KOH}/l$ | $M_{KNO_3}/l$ | $t$ = 0°C (154)* M % $KNO_3$ | M % $HNO_3$ | $t$ = 21°C (154)* M % $KNO_3$ | M % $HNO_3$ | $t$ = 20°C (278) % $HNO_3$ | % $KNO_3$ |
|---|---|---|---|---|---|---|---|---|
| $KNO_3$ | 4.71 | 0.847 | 2.34 | | 5.4 | | | 23.90 |
| | 7.90 | 0.455 | 1.61 | 2.57 | 2.9 | 5.8 | 8.40 | 16.04 |
| | 9.41 | 0.364 | 1.45 | 2.90 | 24.4 | 48.8 | 17.47 | 12.65 |
| | 10.95 | 0.298 | 1.47 | 4.29 | | | 26.93 | 10.23 |
| | 12.19 | 0.271 | 1.53 | 6.42 | | | 34.72 | 13.20 |
| | 14.02 | 0.241 | 1.66 | 10.50 | | | 42.16 | 15.68 |
| | 14.85 | 0.232 | 2.45 | 16.20 | | | 50.17 | 16.39 |
| | 15.02 | 0.233 | 25.20 | 50.40 | | | 54.01 | 22.84 |
| | | | | | | | 59.61 | 25.48 |
| | | | | | | | 60.48 | 32.80 |
| $KNO_3.2HNO_3$ | | | 25.70 | 51.40 | 29.0 | 71.0 | | |
| | | | 17.80 | 82.20 | 32.3 | 64.6 | | |
| $KNO_3.2HNO_3$ + $KNO_3$ | | | | | 37.8 | 62.2 | | |

* Includes data from Engel (118).

**$NH_4^+$ $H_2PO_4^-$ (99, 294)**
$H_2O$ + $NH_4OH$ + $H_3PO_4$; *v.* Fig. 152

| | Solid phases | Liquid phase $t$ = 25°C (99) % $(NH_4)_2O$ | $t$ = 25°C (99) % $P_2O_5$ | $t$ = 25°C (294) % $(NH_4)_2O$ | $t$ = 25°C (294) % $P_2O_5$ |
|---|---|---|---|---|---|
| A | $3(NH_4)_2O.P_2O_5.6H_2O$ | 19.32 | 0.59 | 36.66 | 2.91 |
| | | 13.07 | 1.42 | 29.89 | 3.05 |
| B | | 7.68 | 3.27 | 22.78 | 6.18 |
| | | 7.91 | 7.24 | 17.16 | 9.45 |
| C | | 8.64 | 9.38 | 10.91 | 13.0 |
| | | 12.45 | 16.48 | 11.14 | 18.25 |
| D | $3(NH_4)_2O.P_2O_5.6H_2O$ + $2(NH_4)_2O.P_2O_5.H_2O$ | 16.84 | 22.44 | | |
| | | 16.71 | 22.94 | 16.33 | 24.22 |
| | $2(NH_4)_2O.P_2O_5.H_2O$ | 17.65 | 30.82 | 17.96 | 28.05 |
| | | 18.64 | 34.23 | 18.25 | 31.11 |
| | | | | 19.0 | 33.81 |
| E | $2(NH_4)_2O.P_2O_5.H_2O$ + $(NH_4)_2O.P_2O_5.2H_2O$ | 18.59 | 34.30 | | |

$NH_4^+$ $H_2PO_4^-$.—(*Continued*)

| | Solid phases | Liquid phase $t$ = 25°C (99) % $(NH_4)_2O$ | Liquid phase $t$ = 25°C (99) % $P_2O_5$ | Liquid phase $t$ = 25°C (294) % $(NH_4)_2O$ | Liquid phase $t$ = 25°C (294) % $P_2O_5$ |
|---|---|---|---|---|---|
| G | $(NH_4)_2O.P_2O_5.2H_2O$ | 17.47 | 32.23 | 13.62 | 26.78 |
| | | 7.07 | 18.38 | 10.52 | 23.44 |
| | | 7.95 | 54.67 | 6.72 | 18.25 |
| | | | | 6.25 | 25.71 |
| | | | | 7.21 | 43.25 |

$NH_4^+$ $AsO_2^-$

$H_2O + NH_4OH + HAsO_2$

$t$ = 30°C (351)

| % $NH_3$ | % $AsO_2$ |
|---|---|
| | $As_2O_3$ |
| 0 | 2.26 |
| 1.41 | 10.98 |
| 2.86 | 21.17 |
| | $As_2O_3.(NH_4)_2O$ |
| 2.88 | 18.43 |
| 3.13 | 12.30 |
| 3.91 | 7.63 |
| 6.95 | 4.72 |
| 9.93 | 3.20 |
| 13.98 | 2.50 |
| 14.28 | 2.16 |

$NH_4^+$ $C_2O_4^{--}$ $Th^{++++}$

$H_2O + (NH_4)_2C_2O_4 + Th(C_2O_4)_2$

$t$ = 25°C (168)

M per 1000g soln.

| $(NH_4)_2C_2O_4$ | $Th(C_2O_4)_2$ |
|---|---|
| | $Th(C_2O_4)_2.6H_2O$ |
| 0.00033 | 0.00005 |
| 0.00044 | 0.000081 |
| 0.00072 | 0.000120 |
| 0.00109 | 0.000200 |
| 0.00120 | 0.000208 |
| 0.00130 | 0.000220 |
| 0.00148 | 0.000250 |
| 0.00153 | 0.000260 |
| | $2Th(C_2O_4)_2.(NH_4)_2C_2O_4.7H_2O$ |
| 0.0023 | 0.00038 |
| 0.041 | 0.0121 |
| 0.090 | 0.0210 |
| 0.145 | 0.0382 |
| 0.225 | 0.0599 |

$NH_4^+$ $C_2O_4^{--}$ $Th^{++++}$.—(*Continued*)

M per 1000g soln.

| $(NH_4)_2C_2O_4$ | $Th(C_2O_4)_2$ |
|---|---|
| | $Th(C_2O_4)_2.(NH_4)_2C_2O_4.3H_2O$ |
| 0.3012 | 0.0950 |
| 0.3700 | 0.1203 |
| 0.6012 | 0.1950 |
| | $Th(C_2O_4)_2.(NH_4)_2C_2O_4.3H_2O + (NH_4)_2C_2O_4.H_2O$ |
| 1.480 | 0.563 |

$t$ = 25°C (223)

| % $(NH_4)_2C_2O_4$ | % $Th(C_2O_4)_2$ |
|---|---|
| | $Th(C_2O_4)_2.?H_2O$ |
| 0.03 | 0.03 |
| 0.48 | 0.20 |
| 0.79 | 0.35 |
| | $(NH_4)_2C_2O_4.2Th(C_2O_4)_2.2H_2O$ |
| 0.89 | 0.57 |
| 1.65 | 1.38 |
| 4.83 | 5.06 |
| 10.27 | 12.35 |
| 15.07 | 19.54 |
| | $(NH_4)_2C_2O_4.2Th(C_2O_4)_2.2H_2O + (NH_4)_2C_2O_4.2Th(C_2O_4)_2.7H_2O$ |
| 17.49 | 23.19 |
| | $(NH_4)_2C_2O_4.2Th(C_2O_4)_2.7H_2O + (NH_4)_2C_2O_4$ |
| 17.13 | 22.16 |
| | $(NH_4)_2C_2O_4$ |
| 14.52 | 17.84 |
| 11.68 | 12.77 |
| 8.70 | 7.40 |
| 5.62 | 1.43 |

$NH_4^+$ $C_2O_4^{--}$ $UO_2^{++}$; *v.* p. 367

$NH_4^+$ $CO_3^{--}$; *v.* p. 367

$NH_4^+$ $CO_3^{--}$ $Na^+$ (273): $H_2O + (NH_4)_2CO_3 + Na_2CO_3$

| Solid phases | Liquid phase $t$ = 0°C % $(NH_4)_2CO_3$ | Liquid phase $t$ = 0°C % $Na_2CO_3$ | Liquid phase $t$ = 15°C % $(NH_4)_2CO_3$ | Liquid phase $t$ = 15°C % $Na_2CO_3$ |
|---|---|---|---|---|
| $(NH_4)_2CO_3$ | 35.82 | | 38.27 | |
| $(NH_4)_2CO_3 + Na_2CO_3.\frac{5}{2}H_2O$ | 35.23 | 9.88 | 36.00 | 8.78 |
| $Na_2CO_3.\frac{5}{2}H_2O + Na_2CO_3.10H_2O$ | 13.82 | 9.37 | | |
| $Na_2CO_3.10H_2O$ | | 6.63 | | 14.15 |

$NH_4^+$ $C_2O_4^{--}$ $Na^+$ (314): $H_2O + (NH_4)_2C_2O_4 + Na_2C_2O_4$

| Solid phases | Liquid phase $t$ = 25°C % $(NH_4)_2C_2O_4$ | Liquid phase $t$ = 25°C % $Na_2C_2O_4$ | Liquid phase $t$ = 50°C % $(NH_4)_2C_2O_4$ | Liquid phase $t$ = 50°C % $Na_2C_2O_4$ |
|---|---|---|---|---|
| $(NH_4)_2C_2O_4.H_2O$ | 5.01 | 0 | 9.63 | 0 |
| | 4.88 | 0.89 | 9.46 | 1.25 |
| | 4.81 | 1.82 | 9.32 | 2.45 |
| | 4.75 | 2.85 | 9.21 | 3.57 |
| $(NH_4)_2C_2O_4.H_2O + Na_2C_2O_4$ | 4.74 | 3.41 | 9.19 | 4.05 |
| $Na_2C_2O_4$ | 3.77 | 3.46 | 7.86 | 4.13 |
| | 2.48 | 3.50 | 6.12 | 4.29 |
| | 1.49 | 3.65 | 4.64 | 4.28 |
| | 0.74 | 3.69 | 1.59 | 4.46 |
| | 0 | 3.73 | 0 | 4.54 |

$NH_4^+$ $C_2O_4^{--}$ $K^+$ (314): $H_2O + (NH_4)_2C_2O_4 + K_2C_2O_4$

| Solid phases | Liquid phase $t$ = 25°C % $(NH_4)_2C_2O_4$ | Liquid phase $t$ = 25°C % $K_2C_2O_4$ | Liquid phase $t$ = 50°C % $(NH_4)_2C_2O_4$ | Liquid phase $t$ = 50°C % $K_2C_2O_4$ |
|---|---|---|---|---|
| $(NH_4)_2C_2O_4.H_2O$ | 5.01 | 0 | 9.63 | 0 |
| Solid soln. I* | 4.72 | 2.67 | 8.40 | 7.99 |
| | 4.38 | 6.51 | 7.10 | 16.20 |
| | 4.16 | 9.48 | 6.79 | 17.99 |
| | 4.01 | 12.10 | 6.10 | 22.40 |
| | 3.68 | 15.37 | 5.75 | 24.40 |
| | 3.32 | 19.39 | 4.78 | 30.40 |
| | 3.10 | 21.91 | | |
| | 2.90 | 24.30 | | |
| Solid soln. I* + Solid soln. II* | 1.83 | 26.30 | 4.78 | 30.40 |
| Solid soln. II* | 0.85 | 26.80 | 3.34 | 31.0 |
| $K_2C_2O_4.H_2O$ | 0 | 27.20 | 0 | 33.10 |

* Solid solns. I and II contain $K_2C_2O_4.H_2O$ and $(NH_4)_2C_2O_4.H_2O$.

$NH_4^+$ $C_4H_4O_6^{--}$ $Na^+$ (197)

$H_2O + (NH_4)_2C_4H_4O_6 + Na_2C_4H_4O_6$

| °C | Solid phases | Liquid phase—M per 1000M $H_2O$* A† | Liquid phase—M per 1000M $H_2O$* B† |
|---|---|---|---|
| 12.8 | $NH_4NaC_4H_4O_6.4H_2O$ (*d* and *l*) | 21.05 | 21.05 |
| 16.2 | | 24.30 | 24.30 |
| 16.7 | | 31.90 | 31.90 |
| 26.2 | | 34.40 | 34.40 |
| 21 | $NH_4NaC_4H_4O_6.4H_2O$ (*d* and *l*) + $(NH_4)_2C_4H_4O_6$ (*dl*) | 22.7 | 36.4 |
| 21 | $NH_4NaC_4H_4O_6.4H_2O$ (*d* and *l*) + $Na_2C_4H_4O_6$ (*dl*) | 33.7 | 23.1 |
| 27 | $NH_4NaC_4H_4O_6.4H_2O$ (*d* and *l*) + $NH_4NaC_4H_4O_6$ (*dl*) | 38.6 | 38.6 |
| 35 | $Na_2C_4H_4O_6$ (*dl*) + $(NH_4)_2C_4H_4O_6$ (*dl*) | 33.80 | 44.40 |

* Includes data taken from other sources.

† A = $Na_2C_4H_4O_6$; B = $(NH_4)_2C_4H_4O_6$.

**$NH_4^+ CO_3^{--}$ (378)**
$H_2O + NH_4OH + H_2CO_3$

| Solid phases | Liquid phase | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t$ = 0.1°C | | $t$ = 20°C | | $t$ = 40°C | | $t$ = 60°C | |
| | % $NH_3$ | % $CO_2$ | % $NH_3$ | % $CO_2$ | % $NH_3$ | % $CO_2$ | % $NH_3$ | % $CO_2$ |
| $NH_4HCO_3$ | 2.6 | 6.05 | 3.95 | 9.25 | 6.18 | 14.05 | 7.8 | 17.00 |
| | 8.8 | 12.1 | 9.25 | 13.9 | 10.2 | 17.0 | 14.1 | 21.80 |
| | 10.6 | 14.0 | 14.2 | 18.8 | 14.6 | 21.5 | 18.3 | 26.30 |
| | | | 16.0 | 20.4 | 17.7 | 24.8 | 22.8 | 32.00 |
| $NH_4HCO_3 + 2NH_4HCO_3.(NH_4)_2CO_3.H_2O$ | 11.2 | 14.8 | 17.3* | 21.9* | | | | |
| $NH_4HCO_3 + NH_4CO_2NH_2$ | | | | | 21.0 | 28.2 | 23.7 | 32.30 |
| $2NH_4HCO_3.(NH_4)_2CO_3.H_2O$ | 14.2 | 17.8 | 18.5 | 23.2 | | | | |
| $2NH_4HCO_3.(NH_4)_2CO_3.H_2O + (NH_4)_2CO_3$ | 14.35* | 18.15* | 20.2* | 24.9* | | | | |
| $NH_4HCO_3.NH_4CO_2NH_2$ | | | | | 22.3 | 28.9 | 25.6 | 33.6 |
| | | | | | 26.5 | 31.1 | 26.3 | 34.00 |
| | | | | | 28.1 | 32.3 | 28.6 | 34.90 |
| $(NH_4)_2CO_3$ | 15.1 | 17.6 | 22.0 | 24.8 | | | | |
| | 17.5 | 13.2 | 26.6 | 24.4 | | | | |
| | 25.4 | 13.3 | 28.6 | 24.2 | | | | |
| | 28.7 | 12.0 | | | | | | |
| $(NH_4)_2CO_3 + NH_4CO_2NH_2$ | 33.2 | 13.6 | 29.75* | 23.9* | | | | |
| $NH_4HCO_3.NH_4CO_2NH_2 + NH_4CO_2NH_2$ | | | | | 29.65 | 32.65 | | |
| $NH_4CO_2NH_2$ | 39.7 | 11.6 | 31.2 | 23.8 | 30.5 | 31.2 | 30.5 | 35.90 |
| | 45.0 | 11.2 | 33.5 | 22.9 | 33.2 | 27.2 | 31.6 | 24.00 |

* Average of several determinations.

**$NH_4^+ C_2O_4^{--} UO_2^{++}$ (84)**
$H_2O + (NH_4)_2C_2O_4 + UO_2C_2O_4$

| Solid phases | Liquid phase | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 15°C | | $t$ = 50°C | | $t$ = 75°C | |
| | % $UO_2C_2O_4$ | % $(NH_4)_2C_2O_4$ | % $UO_2C_2O_4$ | % $(NH_4)_2C_2O_4$ | % $UO_2C_2O_4$ | % $(NH_4)_2C_2O_4$ |
| $UO_2C_2O_4.3H_2O$ | 0.47 | 0.0 | 1.00 | 0.0 | | |
| $UO_2C_2O_4.3H_2O + (NH_4)_2C_2O_4.2UO_2C_2O_4.3H_2O$ | 7.19 | 2.14 | | | | |
| $UO_2C_2O_4.3H_2O + (NH_4)_2C_2O_4.2UO_2C_2O_4$ | | | 5.11 | 1.36 | | |
| $(NH_4)_2C_2O_4.2UO_2C_2O_4.3H_2O + (NH_4)_2C_2O_4.UO_2C_2O_4.2H_2O$ | 8.78 | 2.99 | | | | |
| $(NH_4)_2C_2O_4.2UO_2C_2O_4 + (NH_4)_2C_2O_4.UO_2C_2O_4$ | | | 19.89 | 8.52 | | |
| $2(NH_4)_2C_2O_4.UO_2C_2O_4$ | | | | | 28.56 | 18.70 |
| | | | | | 29.59 | 21.17 |
| $(NH_4)_2C_2O_4.UO_2C_2O_4.2H_2O + (NH_4)_2C_2O_4.H_2O$ | 9.66 | 6.43 | | | | |
| $(NH_4)_2C_2O_4.UO_2C_2O_4 + (NH_4)_2C_2O_4$ | | | 23.82 | 15.90 | | |
| $(NH_4)_2C_2O_4.H_2O$ | 0.0 | 3.69 | 0.0 | 9.36 | | |

**$NH_4^+ CrO_4^{--}$**
$H_2O + NH_4OH + H_2CrO_4$; *v.* Fig. 153

| | Solid phases; $t$ = 30°C (336) | Liquid phase | |
|---|---|---|---|
| | | % $(NH_4)_2O$ | % $CrO_3$ |
| A | $(NH_4)_2O.CrO_3$ | 34.17 | 6.933 |
| B | $(NH_4)_2O.CrO_3$ | 9.83 | 18.98 |
| | $(NH_4)_2O.CrO_3$ | 9.74 | 22.53 |
| D | $(NH_4)_2O.CrO_3 + (NH_4)_2O.2CrO_3$ | 10.50 | 27.09 |
| F | $(NH_4)_2O.2CrO_3$ | 7.80 | 25.99 |
| | $(NH_4)_2O.2CrO_3$ | 6.64 | 25.43 |
| G | $(NH_4)_2O.2CrO_3 + (NH_4)_2O.3CrO_3$ | 4.81 | 42.44 |
| H | $(NH_4)_2O.3CrO_3 + (NH_4)_2O.4CrO_3$ | 1.58 | 54.56 |
| I | $(NH_4)_2O.4CrO_3$ | 0.99 | 59.06 |
| | $(NH_4)_2O.4CrO_3 + CrO_3$ | 0.61 | 63.60 |
| | $CrO_3$ | | 62.28 |

**$NH_4^+ C_2O_4^{--} Sc^{+++}$**
$H_2O + (NH_4)_2C_2O_4 + Sc_2(C_2O_4)_3$; $t$ = 25°C (397)

| % $C_2O_3$ | % $Sc_2O_3$ |
|---|---|
| $Sc_2(C_2O_4)_3$ | |
| 1.624 | 0.3019 |
| 2.400 | 0.4012 |
| 4.478 | 0.7108 |

**$NH_4^+ Cu^+$**
$H_2O + NH_4OH + Cu_2O$
$t$ = 25°C (106)

| % $NH_3$ | % Cu |
|---|---|
| CuO (prep. I) | |
| 0.391 | 0.03593 |
| 1.207 | 0.05024 |
| 1.377 | 0.06869 |
| 1.615 | 0.06964 |
| 2.703 | 0.10144 |
| 3.264 | 0.10462 |

**$NH_4^+ Cu^+$.—(*Continued*)**

| % $NH_3$ | % Cu |
|---|---|
| CuO (prep. I) | |
| 3.689 | 0.10557 |
| 4.573 | 0.12243 |
| 6.868 | 0.13229 |
| 7.412 | 0.14882 |
| 8.126 | 0.15105 |
| 9.852 | 0.16313 |
| 12.240 | 0.16981 |
| CuO (prep. II) | |
| 0.782 | 0.04229 |
| 0.816 | 0.06678 |
| 2.261 | 0.09890 |
| 2.839 | 0.10494 |
| 5.416 | 0.13528 |
| 7.208 | 0.15047 |
| 7.820 | 0.15963 |
| 10.205 | 0.16555 |

$NH_4^+ CrO_4^{--} K^+$

$H_2O + (NH_4)_2CrO_4 + K_2CrO_4$

$t = 25°C$ (10)

| Solid phases | M % $(NH_4)_2CrO_4$ | Liquid phase: % $K_2CrO_4$ | Liquid phase: % $(NH_4)_2CrO_4$ |
|---|---|---|---|
| $K_2CrO_4$ | 0.0 | 39.35 | 0.0 |
| Solid soln. I* | 0.45 | 36.77 | 1.41 |
| | 1.07 | 34.38 | 3.25 |
| | 2.77 | 29.36 | 6.75 |
| | 2.85 | 25.34 | 10.29 |
| | 4.86 | 21.34 | 13.70 |
| | 6.50 | 18.64 | 16.51 |
| | 12.18 | 16.07 | 19.10 |
| Solid soln. I* + Solid soln. II* | 33.35 | 15.84 | 19.95 |
| | 50.92 | 15.60 | 20.01 |
| | 81.65 | 14.66 | 20.30 |
| | 94.14 | 14.14 | 20.70 |
| Solid soln. II* | 94.99 | 11.69 | 21.30 |
| | 96.39 | 10.63 | 21.94 |
| | 98.13 | 7.08 | 22.88 |
| | 98.84 | 4.53 | 23.43 |
| $(NH_4)_2CrO_4$ | 100.0 | 0.0 | 25.21 |

* Solid soln. I contains from 0 to 16.75M % $(NH_4)_2CrO_4$; Solid soln. II from 55.5 to 100 %.

$NH_4^+ BO_3^{---}$

$H_2O + NH_4OH + H_3BO_3$

$t = 30°C$ (323)

| % $(NH_4)_2O$ | % $B_2O_3$ |
|---|---|
| $H_3BO_3$ | |
| 0.2345 | 4.0864 |
| 0.7023 | 7.2020 |
| $H_3BO_3 + (NH_4)_2O.5B_2O_3.8H_2O$ | |
| 0.7810 | 7.62 |
| $(NH_4)_2O.5BO_3.8H_2O$ | |
| 0.988 | 7.526 |
| 1.075 | 7.758 |
| 1.0825 | 7.6625 |
| 1.7064 | 9.1345 |
| 1.7585 | 9.275 |
| 2.0219 | 10.022 |
| 2.2465 | 10.709 |
| 2.4477 | 11.30 |
| 2.6649 | 11.858 |
| 2.89 | 12.315 |
| 2.945 | 12.79 |
| 3.125 | 12.59 |
| $2(NH_4)_2O.4B_2O_3.5H_2O$ | |
| 3.4346 | 6.351 |
| 6.5096 | 4.481 |
| 10.45 | 3.366 |
| 17.367 | 2.093 |
| 18.055 | 2.019 |
| 19.233 | 1.976 |
| 24.80 | 1.508 |

$NH_4^+ BO_3^{---}$.—(*Continued*)

| % $(NH_4)_2O$ | % $B_2O_3$ |
|---|---|
| $2(NH_4)_2O.4B_2O_3.5H_2O$ | |
| 25.29 | 1.432 |
| 30.56 | 1.217 |
| 34.225 | 0.908 |
| 43.846 | 0.8049 |
| 45.34 | 0.8448 |

$NH_4^+ B_4O_7^{--} Na^+$; *v. below*

$NH_4^+ AlO_2^-$

$H_2O + NH_4OH + Al(OH)_3$

$t = 20°C$ (12)

| $M_{NH_4OH}/l$ | g $Al(OH)_3/l$ |
|---|---|
| $Al(OH)_3.?H_2O$ | |
| 0.05 | 0.070 |
| 0.100 | 0.080 |
| 0.125 | 0.250 |
| 0.200 | 0.380 |
| 0.500 | 0.450 |
| 1.000 | 0.240 |

$PO_4^{---} Zn^{++}$ (116)

$H_2O + H_3PO_4 + ZnO$

| $t = 25°C$ | | $t = 37°C$ | |
|---|---|---|---|
| % $P_2O_5$ | % ZnO | % $P_2O_5$ | % ZnO |
| $P_2O_5.3ZnO.4H_2O$ | | | |
| 5.08 | 2.38 | 4.87 | 2.08 |
| 9.76 | 4.65 | 9.46 | 4.12 |
| 12.42 | 6.13 | 13.60 | 6.27 |

*Continued on p. 369*

$NH_4^+ B_4O_7^{--} Na^+$ (330)

$H_2O + (NH_4)_2B_4O_7 + Na_2B_4O_7$; *v.* Fig. 154

| Solid phases | Liquid phase—% A = % $(NH_4)_2B_4O_7$; % B = % $Na_2B_4O_7$ | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t = 0°C$ | | $t = 10°C$ | | $t = 16°C$ | | $t = 20°C$ | | $t = 25°C$ | | $t = 35°C$ | |
| | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B |
| $Na_2B_4O_7.10H_2O$ | | 1.10 | | 1.60 | | 2.13 | | 2.52 | | 3.09 | | 4.83 |
| | | | 1.20 | 1.37 | | | | | 8.16* | 3.04* | 3.29* | 4.63* |
| | | | 4.33 | 1.24 | | | | | 8.77* | 3.07* | 9.81* | 5.12* |
| $Na_2B_4O_7.10H_2O + (NH_4)_2B_4O_7.4H_2O$ | 3.22 | 0.85 | 4.91 | 1.24 | 6.60 | 1.83 | 7.73 | 2.22 | 9.27* | 3.07* | 13.42* | 5.54* |
| $(NH_4)_2B_4O_7.4H_2O$ | | | 4.96 | 0.93 | 6.61 | | 7.64 | | 9.26 | 2.77 | 13.27* | 3.42* |
| | 3.76 | | 5.26 | | | | | | 9.00 | | 13.02* | |

| Solid phases | Liquid phase—% A = % $(NH_4)_2B_4O_7$; % B = % $Na_2B_4O_7$ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $t = 45°C$ | | $t = 50.5°C$ | | $t = 55°C$ | | $t = 57°C$ | | $t = 65°C$ | |
| | % A | % B | % A | % B | % A | % B | % A | % B | % A | % B |
| $Na_2B_4O_7.10H_2O$ | | 7.49 | | 9.76 | | 12.37 | | 13.90 | | |
| | 10.79 | 8.76 | 18.18 | 13.31 | 12.44 | 15.60 | 11.07 | 16.29 | | |
| $Na_2B_4O_7.10H_2O + (NH_4)_2B_4O_7.4H_2O$ | 18.62* | 9.99* | | | | | | | | |
| $Na_2B_4O_7.10H_2O + Na_2B_4O_7.5H_2O$ | | | 21.10* | 13.74* | 19.30* | 17.29* | 14.28* | 17.25* | | |
| $Na_2B_4O_7.5H_2O$ | | | | | 21.34 | 17.35 | 15.88 | 17.27 | | 17.95 |
| | | | | | | | | | 10.70 | 18.70 |
| $Na_2B_4O_7.5H_2O + (NH_4)_2B_4O_7.4H_2O$ | | | 21.16 | 13.82 | 23.48* | 17.47* | 24.65 | 17.60 | 28.94* | 19.36* |
| $(NH_4)_2B_4O_7.4H_2O$ | 18.41 | | 21.21 | 12.30 | 23.69 | | 25.10 | | 28.94 | 18.56 |
| | | | 21.20 | | | | | | 30.80 | |

| Invariant points | | % A | % B |
|---|---|---|---|
| −0.45°C | $Na_2B_4O_7.10H_2O$ + Ice | | 1.09 |
| −1.07 | $(NH_4)_2B_4O_7.4H_2O$ + Ice | 3.62 | |
| −1.22 | $Na_2B_4O_7.10H_2O + (NH_4)_2B_4O_7.4H_2O$ + Ice | 3.47 | 0.64 |

* Mean of more than one determination.

**$PO_4^{---}$ $Zn^{++}$.**—(*Continued from p. 368*)

| $t$ = 25°C | | $t$ = 37°C | |
|---|---|---|---|
| % $P_2O_5$ | % ZnO | % $P_2O_5$ | % ZnO |
| $P_2O_5.3ZnO.4H_2O$ | | | |
| 14.00 | 6.74 | 18.13 | 8.78 |
| 14.37 | 6.97 | 19.48 | 9.66 |
| $P_2O_5.3ZnO.4H_2O + P_2O_5.2ZnO.7H_2O$ | | | |
| 15.20 | 7.50 | 20.30 | 10.10 |
| $P_2O_5.2ZnO.7H_2O$ | | | |
| 15.98 | 7.71 | 21.96 | 10.88 |
| 18.33 | 8.73 | 26.75 | 13.26 |
| 22.75 | 10.74 | 29.65 | 14.77 |
| 26.48 | 12.47 | 33.39 | 17.06 |
| 30.09 | 14.16 | | |
| 33.79 | 15.82 | | |
| 37.76 | 17.65 | | |
| $P_2O_5.2ZnO.7H_2O + P_2O_5.2ZnO.3H_2O$ | | | |
| 40.00 | 18.80 | 34 *ca.* | |
| $P_2O_5.2ZnO.3H_2O$ | | | |
| 42.05 | 16.14 | 34.58 | 17.92 |
| 44.53 | 13.20 | 36.13 | 16.00 |
| 48.70 | 9.58 | 39.93 | 16.12 |
| 52.25 | 7.64 | 44.89 | 17.83 |
| 55.97 | 7.23 | 46.41 | 14.74 |
| | | 51.35 | 11.26 |
| | | 54.32 | 10.82 |

**$PO_4^{---}$ $Pb^{++}$**

$H_2O + H_3PO_4 + PbO$

$t$ = 25°C (121)

| % $P_2O_5$ | % PbO |
|---|---|
| $2PbO.P_2O_5.H_2O$ | |
| 5.09 | 0.134 |
| 9.91 | 0.228 |
| 14.43 | 0.329 |
| 18.84 | 0.510 |
| 22.91 | 0.690 |
| 26.74 | 0.777 |
| 31.00 | 0.792 |
| 34.82 | 0.903 |
| 39.96 | 1.088 |
| 45.74 | 1.480 |

**$PO_4^{---}$ $Pb^{++}$.**—(*Continued*)

| % $P_2O_5$ | % PbO |
|---|---|
| $PbO.P_2O_5.2H_2O$ | |
| 50.73 | 1.299 |
| 53.06 | 0.999 |
| 54.89 | 0.756 |
| 58.53 | 0.473 |

**$PO_4^{---}$ $Fe^{++}$**

$H_2O + H_3PO_4 + FeO$

$t$ = 70°C (71)

| % FeO | % $P_2O_5$ |
|---|---|
| $2FeO.P_2O_5.5H_2O$ | |
| 2.76 | 7.38 |
| 4.38 | 12.06 |
| 5.53 | 14.46 |
| 5.48 | 14.96 |
| 5.54 | 15.10 |
| $2FeO.P_2O_5.3H_2O$* | |
| 1.31 | 7.71 |
| 1.39 | 9.18 |
| 1.43 | 9.88 |
| 1.53 | 10.99 |
| 1.60 | 11.25 |
| $2FeO.P_2O_5.3H_2O$† | |
| 1.42 | 10.10 |
| 1.45 | 10.60 |
| 1.55 | 11.50 |
| 1.60 | 11.90 |
| $FeO.P_2O_5.4H_2O$ | |
| 1.58 | 10.50 |
| 1.60 | 8.77 |
| 1.61 | 6.29 |
| 1.63 | 4.87 |
| 1.71 | 3.15 |

* Crystalline. † Amorphous.

**$PO_4^{---}$ $Fe^{+++}$**

$H_2O + H_3PO_4 + Fe_2O_3$

$t$ = 25°C (70)

| % $Fe_2O_3$ | % $P_2O_5$ |
|---|---|
| $Fe_2O_3.P_2O_5.5H_2O$* | |
| Tr. | 5.93 |
| 0.23 | 10.10 |
| 1.40 | 14.10 |
| 2.43 | 19.80 |
| 4.42 | 21.70 |

**$PO_4^{---}$ $Fe^{+++}$.**—(*Continued*)

$t$ = 70°C; *v.* Fig. 155 (70)

| | Solid phases | Liquid phase: % $Fe_2O_3$ | Liquid phase: % $P_2O_5$ |
|---|---|---|---|
| A | $Fe_2O_3.P_2O_5.5H_2O$ | Tr. | 4.07 |
| B | | 1.08 | 23.56 |
| C | | 5.45 | 37.43 |
| D | $Fe_2O_3.2P_2O_5.8H_2O$ | 7.12 | 43.92 |
| E | | 8.10 | 52.32 |
| | $Fe_2O_3.3P_2O_5.10H_2O$ | 9.79 | 53.20 |
| G | | 8.68 | 55.84 |
| H | $Fe_2O_3.3P_2O_5.6H_2O$ | 5.28 | 58.07 |
| I | | 3.46 | 60.47 |

* Graphical representation of the above data indicates that the solid phase is $Fe_2O_3.P_2O_5.5H_2O$. From solutions containing less $P_2O_5$, unknown hydrates of the same salt were obtained. These hydrates were found to adsorb $P_2O_5$ and the variable proportions of $Fe_2O_3$ and $P_2O_5$ found in the solid phases obtained by Cameron and Bell (58) are probably due to adsorption. The pentahydrate is not able to adsorb these substances.

**$PO_4^{---}$ $Mg^{++}$: $H_2O + H_3PO_4 + MgO$**

$t$ = 25°C (58)

| % MgO | % $P_2O_5$ | % MgO | % $P_2O_5$ |
|---|---|---|---|
| $MgHPO_4.3H_2O$ | | $MgHPO_4.3H_2O$ | |
| 0.221 | 0.731 | 9.204 | 39.079 |
| 1.074 | 3.703 | $MgH_4(PO_4)_2.xH_2O$ | |
| 3.269 | 11.425 | 0.5357 | 47.946 |
| 5.876 | 21.930 | 0.4268 | 50.490 |
| 8.340 | 33.904 | | |

**$PO_4^{---}$ $Ca^{++}$**; *v.* p. 370

**$PO_4^{---}$ $Na^+$ (99): $H_2O + H_3PO_4 + NaOH$**; *v.* Fig. 157

| | Solid phases | Liquid phase, 25°C: % $P_2O_5$ | Liquid phase, 25°C: % $Na_2O$ |
|---|---|---|---|
| A | $P_2O_5.3Na_2O.24H_2O$ | 0.29 | 13.26 |
| B | | 1.30 | 10.04 |
| | | 5.34 | 6.95 |
| | | 7.67 | 8.46 |
| C | $P_2O_5.3Na_2O.24H_2O + P_2O_5.2Na_2O.25H_2O$ | 9.45 | 10.79 |
| D | $P_2O_5.2Na_2O.25H_2O$ | 5.54 | 4.84 |
| | | 11.36 | 7.38 |
| | | 25.21 | 14.42 |
| E | $P_2O_5.2Na_2O.25H_2O + P_2O_5.2Na_2O.15H_2O$ | 27.49 | 17.45 |
| | $P_2O_5.2Na_2O.15H_2O$ | 32.88 | 19.56 |
| F | $P_2O_5.2Na_2O.15H_2O + P_2O_5.2Na_2O.5H_2O$ | 34.66 | 20.96 |
| G | $P_2O_5.2Na_2O.5H_2O$ | 33.17 | 18.63 |
| | | 28.62 | 12.59 |
| H | | 31.11 | 12.99 |
| | | 41.83 | 14.42 |
| | | 45.45 | 15.13 |

Transition points

$Na_3PO_4.12H_2O \leftrightarrow$ ? at 70.75 ± 0.1°C.

$Na_2HPO_4.12H_2O \leftrightarrow Na_2HPO_4.7H_2O$ + Solution at 35.4 ± 0.05°C

$Na_2HPO_4.7H_2O \leftrightarrow Na_2HPO_4.2H_2O$ + Solution at 48.35 ± 0.05°C.

Hammick and Goodby (160) report the following:

$Na_2HPO_4.12H_2O\alpha \leftrightarrow Na_2HPO_4.12H_2O\beta$ at 29.6°C.

$Na_2HPO_4.12H_2O\alpha \leftrightarrow Na_2HPO_4.7H_2O$ + Solution at 35°C.

$Na_2HPO_4.12H_2O\beta \leftrightarrow$ Ice + Solution at −47°C.

$Na_2HPO_4.7H_2O \leftrightarrow Na_2HPO_4.2H_2O$ + Solution at 48°C.

$Na_2HPO_4.2H_2O \leftrightarrow Na_2HPO_4$ + Solution at 95.2°C.

**$PO_4^{---}$ $K^+$ (99, 294)**

$H_2O + H_3PO_4 + KOH$; *v.* Fig. 158

| | Solid phases | Liquid phase, 25°C: % $P_2O_5$ | Liquid phase, 25°C: % $K_2O$ |
|---|---|---|---|
| A | $3K_2O.P_2O_5.6H_2O$ | 1.63* | 46.10* |
| | | 3.41* | 43.28* |
| B | | 14.70* | 33.63* |
| C | | 20.74* | 41.49* |
| D | $3K_2O.P_2O_5$ | 22.23 | 43.05 |
| | | 29.33 | 32.45 |
| E | | 27.84* | 32.02* |
| F | $2K_2O.P_2O_5.H_2O$ | 23.08 | 24.68 |
| G | | 20.88 | 20.82 |
| H | | 12.15 | 8.00 |
| I | $2K_2O.P_2O_5.H_2O + K_2O.P_2O_5.2H_2O$ | 10.37* | 6.88* |
| | | 10.51 | 6.87 |
| J | $K_2O.P_2O_5.2H_2O$ | 22.37 | 8.38 |
| K | | 62.50 | 15.64 |
| L | $K_2O.2P_2O_5.5H_2O$ | 60.80* | 6.59* |
| M | | 47.87* | 6.92* |

* Results of Parker (294).

$PO_4^{---}$ $Ca^{++}$ (24): $H_2O + H_3PO_4 + CaO$; *v.* Fig. 156

| Solid phases | Liquid phase* | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 25°C* | | $t$ = 40°C | | $t$ = 50.7°C | |
| | % $P_2O_5$ | % CaO | % $P_2O_5$ | % CaO | % $P_2O_5$ | % CaO |
| $CaO.P_2O_5.2H_2O + CaO.P_2O_5.3H_2O$ | | | | | 62.01 | 0.336 |
| $CaO.P_2O_5.3H_2O$ | 36.11 | 3.088 | 45.42 | 1.768 | 58.08 | 0.635 |
| $CaO.P_2O_5.3H_2O + CaHPO_4$ | 24.20 | 5.80 | 27.25 | 5.755 | 29.61 | 5.725 |
| $CaHPO_4 + CaHPO_4.2H_2O$ | 0.417 | 0.165 | | | | |
| $CaHPO_4.2H_2O + 3CaO.P_2O_5.H_2O$ | 0.140 | 0.051 | | | | |
| $CaHPO_4 + 3CaO.P_2O_5.H_2O$ | | | 0.140 | 0.0515 | 0.1435 | 0.0565 |
| $3CaO.P_2O_5.H_2O + 4CaO.P_2O_5.4H_2O$ | 0.0015 | 0.0034 | 0.000650 | 0.00065 | 0.0006 | 0.0006 |
| $4CaO.P_2O_5.4H_2O + CaO.H_2O$ | 0 | 0.1131 | | | | |
| $CaO.H_2O$ | 0 | 0.118 | | 0.102 | | 0.0953 |

* These data are in fair agreement with the results of Cameron and Bell (57).

$H_2PO_4^-$ $H_2AsO_4^-$ $K^+$
$H_2O + KH_2PO_4 + KH_2AsO_4$; *v.* Fig. 159
$t$ = 6.8 − 7.2°C (277)

| Solid phase—Solid soln., Wt. % $KH_2AsO_4$ | Liquid phase | |
|---|---|---|
| | % $KH_2PO_4$ | % $KH_2AsO_4$ |
| | 21.48 | |
| 11.19 | 18.77 | 3.20 |
| 18.42 | 17.40 | 5.08 |
| 27.08 | 15.28 | 7.78 |
| 36.46 | 13.46 | 10.15 |
| 46.49 | 11.50 | 12.64 |
| 56.96 | 9.28 | 14.97 |
| 67.75 | 6.74 | 17.14 |
| 77.63 | 4.26 | 19.50 |
| 88.19 | 2.43 | 21.33 |
| 100 | | 23.62 |

$AsO_2^-$ $Li^+$
$H_2O + H_3AsO_3 + LiOH$
$t$ = 25°C (355)

| % $As_2O_3$ | % $Li_2O$ |
|---|---|
| $As_2O_3$ | |
| 2.02 | 0 |
| 6.46 | 0.45 |
| $As_2O_3.Li_2O$ | |
| 10.26 | 0.84 |
| 4.19 | 2.26 |
| 6.32 | 5.36 |
| $As_2O_3.Li_2O + Li_2O.3H_2O$ | |
| 7.50 | 7.63 |
| $Li_2O.3H_2O$ | |
| 3.81 | 7.81 |
| 0 | 7.15 |

$AsO_2^-$ $Na^+$
$H_2O + H_3AsO_3 + NaOH$
$t$ = 25°C (354)

| % $As_2O_3$ | % $Na_2O$ |
|---|---|
| $As_2O_3$ | |
| 2.019 | 0 |
| 14.45 | 2.45 |
| 24.42 | 4.23 |
| 37.73 | 6.46 |
| 58.54 | 9.60 |
| $As_2O_3 + As_2O_3.Na_2O$ | |
| 73.0 *ca.* | 12.0 *ca.* |
| $As_2O_3.Na_2O$ | |
| 63.01 | 12.73 |
| 60.46 | 13.06 |
| 57.90 | 13.24 |

$AsO_2^-$ $Na^+$.—(*Continued*)

| % $As_2O_3$ | % $Na_2O$ |
|---|---|
| $As_2O_3.Na_2O$ | |
| 53.48 | 13.73 |
| 48.05 | 14.27 |
| 40.61 | 16.24 |
| 36.32 | 18.74 |
| 35.17 | 20.68 |
| 34.83 | 21.06 |
| $As_2O_3.Na_2O + As_2O_3.2Na_2O.9H_2O$ | |
| 34.0 *ca.* | 21.1 *ca.* |
| $As_2O_3.2Na_2O.9H_2O$ | |
| 32.24 | 21.60 |
| 31.05 | 21.82 |
| 29.54 | 22.68 |
| $As_2O_3.2Na_2O.9H_2O + 2As_2O_3.5Na_2O.26H_2O$ | |
| 29.0 *ca.* | 22.7 *ca.* |
| $2As_2O_3.5Na_2O.26H_2O$ | |
| 27.34 | 22.73 |
| 21.92 | 24.04 |
| 20.73 | 24.49 |
| 17.50 | 25.64 |
| 14.44 | 28.18 |
| 14.63 | 30.24 |
| 16.61 | 31.37 |
| $2As_2O_3.5Na_2O.26H_2O + As_2O_3.2Na_2O$ | |
| 19.32 | 32.04 |
| $As_2O_3.2Na_2O$ | |
| 15.53 | 33.57 |
| 10.49 | 36.67 |

$AsO_2^-$ $Na^+$.—(*Continued*)

| % $As_2O_3$ | % $Na_2O$ |
|---|---|
| $As_2O_3.2Na_2O$ | |
| 7.96 | 37.91 |
| 6.35 | 39.54 |
| $As_2O_3.2Na_2O + NaOH.H_2O$ | |
| 6.59 | 39.39 |
| $NaOH.H_2O$ | |
| 5.11 | 39.69 |
| 0.0 | 41.20* |

* By interpolation from earlier work.

$AsO_2^-$ $K^+$
$H_2O + H_3AsO_3 + KOH$
$t$ = 25°C (355)

| % $As_2O_3$ | % $K_2O$ |
|---|---|
| $As_2O_3$ | |
| 2.02 | 0 |
| 22.63 | 5.61 |
| 36.29 | 8.78 |
| 54.02 | 11.62 |
| $2As_2O_3.K_2O$ | |
| 58.11 | 13.74 |
| 49.02 | 20.19 |
| $2As_2O_3.3K_2O.12H_2O$ | |
| 48.96 | 24.16 |
| 39.49 | 23.49 |
| 20.98 | 32.93 |
| 29.61 | 38.32 |
| $K_2O.3H_2O$ | |
| 23.82 | 42.48 |
| $K_2O.5H_2O$ | |
| 11.53 | 44.13 |
| 0 | 45.50 |

$AsO_4^{---}$ $Ca^{++}$
$H_2O + H_3AsO_4 + Ca_3(AsO_4)_2$
$t$ = 35°C (362); *v.* Fig. 160

| % $As_2O_5$ | % CaO |
|---|---|
| $As_2O_5.2CaO.5H_2O$ | |
| 0.198 | 0.096 |
| 2.711 | 0.702 |
| 7.98 | 1.903 |
| 12.97 | 3.206 |
| 18.70 | 4.59 |
| 19.99 | 4.64 |
| 21.97 | 5.34 |
| $As_2O_5.CaO.2H_2O$ | |
| 28.78 | 6.54 |
| 35.03 | 5.34 |

$AsO_4^{---}$ $Ca^{++}$.—(*Continued*)

| % $As_2O_5$ | % CaO |
|---|---|
| $As_2O_5.CaO.2H_2O$ | |
| 43.43 | 4.07 |
| 50.30 | 2.95 |
| 55.43 | 1.87 |
| 62.66 | 0.822 |
| 71.04 | 0.135 |
| 72.14 | 0.114 |

$AsO_4^{---}$ $Ba^{++}$
$H_2O + H_3AsO_4 + BaO$
$t$ = 30°C (173)

| % BaO | % $As_2O_5$ |
|---|---|
| $BaHAsO_4.H_2O + Ba_3(AsO_4)_2.xH_2O$ | |
| 0.025 | 0.030 |
| $BaHAsO_4.H_2O$ | |
| 2.63 | 3.98 |
| 4.36 | 7.26 |
| 5.49 | 9.28 |
| 6.62 | 11.27 |
| 9.46 | 14.92 |
| 11.67 | 18.52 |
| 13.59 | 22.95 |
| $BaHAsO_4.H_2O + BaH_4(AsO_4)_2.2H_2O$ | |
| 16.65 | 28.01 |
| $BaH_4(AsO_4)_2.2H_2O$ | |
| 13.70 | 35.10 |
| 7.53 | 47.27 |
| 6.56 | 48.48 |
| $BaH_4(AsO_4)_2.2H_2O + 3As_2O_5.5H_2O$ | |
| Tr. | 72.04 |

$BiO^+$ $CrO_4^{--}$
$H_2O + Bi(OH)_3 + H_2CrO_4$
$t$ = 25°C (90)

| $M_{Bi_2O_3}$/l | $M_{CrO_3}$/l |
|---|---|
| $CrO_3 + Bi_2O_3.4CrO_3$ | |
| 0.1 | 11.17 |
| $Bi_2O_3.4CrO_3$ | |
| 0.04 | 7.92 |
| $Bi_2O_3.4CrO_3 + Bi_2O_3.2CrO_3$ | |
| 0.04 | 7.80 |
| $Bi_2O_3.2CrO_3$ | |
| $M_{CrO_3}$/l | $M_{CrO_3}$/l |
| 7.22 | 0.119 |
| 4.666 | 0.013 |
| 1.470 | 0.0002 |
| 0.535 | |

**$CO_3^{--}$ $HCO_3^-$ $Na^+$ (141, 251): $H_2O + Na_2CO_3 + NaHCO_3$; *v.* Fig. 161**

| Solid phases | Liquid phase (141) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 15°C | | $t$ = 20°C | | $t$ = 25°C | | $t$ = 30°C | | $t$ = 35°C | | $t$ = 45°C | | $t$ = 60°C | |
| | % $Na_2CO_3$ | % $NaHCO_3$ | % $Na_2CO_3$ | % $NaHCO_3$ | % $Na_2CO_3$ | % $NaHCO_3$ | % $Na_2CO_3$ | % $NaHCO_3$ | % $Na_2CO_3$ | % $NaHCO_3$ | % $Na_2CO_3$ | % $NaHCO_3$ | % $Na_2CO_3$ | % $NaHCO_3$ | % $Na_2CO_3$ | % $NaHCO_3$ |
| $NaHCO_3$ | 0.0 | 6.5 | 0.0 | 8.1 | 0.0 | 8.7 | 0.0 | 9.3 | 0.0 | 9.9 | 0.0 | 10.6 | 0.0 | 12.0 | | |
| | 4.0 | 5.1 | 6.0 | 6.0 | 3.5 | 7.2 | 6.1 | 4.9 | 0.8 | 9.1 | 9.7 | 6.9 | 0.8 | 11.3 | 1.4 | 2.9 |
| | | | | | 6.3 | 6.5 | 10.0 | 3.9 | 9.7 | 6.3 | | | 8.7 | 8.0 | 8.5 | 10.1 |
| $NaHCO_3 + NaHCO_3.Na_2CO_3.2H_2O$ | | | | | | | 16.7 | 3.3 | 17.5 | 4.6 | | | | | | |
| | | | | | | | 17.9* | 4.05* | 17.6 | 4.3 | 17.3 | 4.7 | 16.9 | 5.9 | 16.9 | 7.4 |
| $NaHCO_3.Na_2CO_3.2H_2O$ | | | | | | | | | 18.3 | 3.8 | 23.7 | 2.0 | 21.4 | 3.0 | 25.8 | 2.4 |
| | | | | | | | 20.8 | 2.5 | 26.1 | 1.2 | 28.7 | 0.9 | 27.3 | 1.3 | | |
| | | | | | | | | | 26.5 | 1.1 | | | | | | |
| $NaHCO_3.Na_2CO_3.2H_2O + Na_2CO_3.10H_2O$ | | | | | | | 22.6 | 1.5 | 27.1 | 1.3 | | | 31.7 | 0.9 | 30.7 | 1.3 |
| $NaHCO_3 + Na_2CO_3.10H_2O$ | 5.6 | 4.6 | 13.3 | 4.3 | 17.05* | 4.0* | | | | | | | | | | |
| $Na_2CO_3.10H_2O$ | 5.9 | 1.4 | 13.8 | 1.8 | 17.3 | 2.9 | 22.7 | 0.0 | 27.5 | 0.8 | | | | | | |
| | 6.4 | 0.0 | 14.1 | 0.0 | 18.0 | | | | 28.45 | 0.0 | | | | | | |
| $Na_2CO_3.NaHCO_3.2H_2O + Na_2CO_3.7H_2O$ | | | | | | | | | | | 32.5 | 0.6 | | | | |
| $Na_2CO_3.7H_2O$ | | | | | | | | | | | 32.8 | 0.3 | | | | |
| | | | | | | | | | | | 32.9 | 0.0 | | | | |
| $Na_2CO_3.H_2O$ | | | | | | | | | | | | | 32.2 | 0.0 | 31.8 | 0.0 |

Transition temperatures (141)

$Na_2CO_3.10H_2O + NaHCO_3 + Na_2CO_3.NaHCO_3.2H_2O = 19.7°C.$

$Na_2CO_3.10H_2O + Na_2CO_3.7H_2O + Na_2CO_3.NaHCO_3.2H_2O = 31°C.$

$Na_2CO_3.7H_2O + Na_2CO_3.H_2O + Na_2CO_3.NaHCO_3.2H_2O = 34.5°C.$

| Solid phases | Liquid phase, $t$ = 25°C (251) | |
|---|---|---|
| | g $NaHCO_3$/l | g $Na_2CO_3$/l |
| $NaHCO_3$ | 98.7 | 0 |
| $NaHCO_3 + Na_2CO_3.NaHCO_3.2H_2O$ | 50.8 | 216.6 |
| $Na_2CO_3.NaHCO_3.2H_2O + Na_2CO_3.10H_2O$ | 27.6 | 276.3 |
| $Na_2CO_3.10H_2O$ | 0 | 276.4 |

* Average of two results.

**$BiO^+$ $Na^+$ (274)**

$H_2O + Bi(OH)_3 + NaOH$

| $t$ = 20°C | | $t$ = 100°C | |
|---|---|---|---|
| g NaOH/l | g Bi/l | g NaOH/l | g Bi/l |
| $Bi(OH)_3$ + BiO.OH* | | | |
| 20 | | | |
| 40 | Tr. | 20 | 0.15 |
| 80 | 0.04 | 40 | 0.20 |
| 160 | 0.07 | 80 | 0.35 |
| 120 | 0.08 | 160 | 0.50 |
| 200 | 0.10 | 200 | 0.50 |
| 240 | 0.11 | 320 | 1.20 |
| 320 | 0.11 | 400 | 1.70 |
| 400 | 0.16 | | |

* Composition of solid phases not verified; at higher concentrations of NaOH mainly BiO.OH.

**$BiO^+$ $K^+$ (274)**

$H_2O + Bi(OH)_3 + KOH$

| $t$ = 20°C | | $t$ = 100°C | |
|---|---|---|---|
| g KOH/l | g Bi/l | g KOH/l | g Bi/l |
| $Bi(OH)_3$ + BiO.OH* | | | |
| 28 | | 28 | 0.15 |
| 56 | Tr. | 56 | 0.20 |

**$BiO^+$ $K^+$.—(*Continued*)**

| $t$ = 20°C | | $t$ = 100°C | |
|---|---|---|---|
| g KOH/l | g Bi/l | g KOH/l | g Bi/l |
| $Bi(OH)_3$ + BiO.OH* | | | |
| 112 | 0.03 | 112 | 0.30 |
| 168 | 0.06 | 224 | 0.50 |
| 224 | 0.08 | 280 | 0.50 |
| 280 | 0.10 | 448 | 1.20 |
| 336 | 0.11 | 560 | 1.65 |
| 448 | 0.11 | | |
| 560 | 0.14 | | |

* Composition of solid phases not verified; at higher concentrations of KOH mainly BiO.OH.

**$CO_3^{--}$ $HCO_3^-$ $Cu^{++}$ $Na^+$**

$H_2O + CuCO_3 + Na_2CO_3 + NaHCO_3$; $t$ = 18°C (7)

| g Cu/l | g $Na_2CO_3$/l | g $NaHCO_3$/l |
|---|---|---|
| $Na_2CO_3.CuCO_3.3H_2O$ + $NaHCO_3$ | | |
| 0 | 9.27 | 87.79 |
| 0.0509 | 11.08 | 86.45 |
| 0.0542 | 13.44 | 85.27 |
| 0.0870 | 62.36 | 72.65 |

**$CO_3^{--}$ $HCO_3^-$ $Cu^{++}$ $Na^+$.—(*Continued*)**

| g Cu/l | g $Na_2CO_3$/l | g $NaHCO_3$/l |
|---|---|---|
| $Na_2CO_3.CuCO_3.3H_2O$ + $NaHCO_3$ | | |
| 0.1061 | 99.30 | 64.10 |
| 0.1411 | 152.63 | 56.24 |
| 0.1553 | 168.75 | 53.60 |
| $Na_2CO_3.CuCO_3.3H_2O$ + $NaHCO_3$ + $Na_2CO_3.10H_2O$ | | |
| | 185.02 | 53.77 |

**$CO_3^{--}$ $HCO_3^-$ $Cu^{++}$ $Na^+$.—(*Continued*)**

| g Cu/l | g $Na_2CO_3$/l | g $NaHCO_3$/l |
|---|---|---|
| $Na_2CO_3.CuCO_3.3H_2O$ + $Na_2CO_3.10H_2O$ | | |
| | 193.13 | 17.64 |
| | 195.57 | 7.48 |
| 0.257 | 197.08 | 18.94 |

**$CO_3^{--}$ $HCO_3^-$ $K^+$ (404)**

$H_2O + K_2CO_3 + KHCO_3$

**$CO_3^{--}$ $Pb^{++}$ $CrO_4^{--}$ $K^+$ (150)**

$H_2O + PbCO_3 + K_2CrO_4$

| Solid phases | Liquid phase—M per 1000M $H_2O$ | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 25°C | | | $t$ = 40°C | | |
| | 0.5$K_2CO_3$ | 0.5$K_2CrO_4$ | 0.5$PbCO_3$ | 0.5$K_2CO_3$ | 0.5$K_2CrO_4$ | 0.5$PbCO_3$ |
| $K_2CrO_4 + PbCrO_4$ | | 121.4 | | | 129.154 | |
| $K_2CrO_4 + PbCrO_4 + K_2CO_3$ | 236.8 | 3.388 | 0.859 | 243.0 | 4.070 | 1.438 |
| $PbCO_3 + PbCrO_4 + K_2CO_3$ | 242.72 | 2.052 | 1.603 | 245.28 | 3.332 | 1.706 |
| $PbCO_3 + K_2CO_3$* | 259.74 | | 2.010 | 269.22 | | 2.470 |
| $PbCO_3 + PbCrO_4$ | 1.690 | 0.309 | | 1.546 | 0.454 | |
| | 7.475 | 0.524 | | 7.152 | 0.848 | |
| | 19.222 | 0.778 | | 18.800 | 1.201 | |

* Some evidence of a double carbonate or solid solution.

### $CO_3^{--}$ $MnO_4^-$ $K^+$ (319)
$H_2O + K_2CO_3 + KMnO_4$

| Solid phase | Liquid phase—M per liter | | | | | |
|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 25°C | | = 40°C | |
| | $K_2CO_3$ | $KMnO_4$ | $K_2CO_3$ | $KMnO_4$ | $K_2CO_3$ | $KMnO_4$ |
| $KMnO_4$ | 0.05 | 0.1462 | 0.05 | 0.4375 | 0.05 | 0.7380 |
| | 0.5 | 0.0629 | 0.5 | 0.2589 | 0.5 | 0.5007 |
| | 1 | 0.0446 | | | 1 | 0.3519 |
| | 2 | 0.027 | 2 | 0.093 | | |
| | 3 | 0.0156 | | | | |

### $CO_3^{--}$ $Zn^{++}$ $Na^+$ (411)
$H_2O + ZnO + Zn(OH)_2 + Na_2ZnO_2 + Na_2CO_3$

### $CO_3^{--}$ $Mg^{++}$ $Na^+$
$H_2O + MgCO_3 + Na_2CO_3$
$t$ = 25°C (69)

| g $MgCO_3$/l | g $Na_2CO_3$/l |
|---|---|
| ?* | |
| 0.223 | 0 |
| 0.288 | 23.12 |
| 0.510 | 50.75 |
| 0.879 | 86.42 |
| 1.314 | 127.30 |
| 1.636 | 160.80 |
| 1.972 | 181.90 |
| 2.317 | 213.20 |

*Solid phase not examined after saturation.

### $CO_3^{--}$ $Na^+$; $CO_3^{--}$ $Na^+$ $K^-$;
v. p. 373

### $CO_3^{--}$ $K^+$
$H_2O + KOH + K_2CO_3$
$t$ = 30°C (390)

| % KOH | % $K_2CO_3$ |
|---|---|
| $KOH.2H_2O$ | |
| 55.75 | 0 |
| $KOH.2H_2O + K_2CO_3.\frac{3}{2}H_2O$ | |
| 55.14 | 2.05 |
| $K_2CO_3.\frac{3}{2}H_2O$ | |
| 53.77 | 2.50 |
| 0 | 53.27 |

### $C_2O_4^{--}$ $Hg^{++}$ $K^+$
$H_2O + HgC_2O_4 + K_2C_2O_4$
$t$ = 20°C (385)

| % $K_2C_2O_4$ | % $HgC_2O_4$ |
|---|---|
| $K_2C_2O_4.H_2O$ | |
| 34.93 | 0.0 |
| 35.08 | 0.16 |

### $C_2O_4^{--}$ $Hg^{++}$ $K^+$.—(*Cont'd*)

| % $K_2C_2O_4$ | % $HgC_2O_4$ |
|---|---|
| $K_2C_2O_4.H_2O + 3K_2C_2O_4.HgC_2O_4.4H_2O$ | |
| 35.36 | 0.36 |
| $3K_2C_2O_4.HgC_2O_4.4H_2O$ | |
| 35.34 | 0.43 |
| $3K_2C_2O_4.HgC_2O_4.4H_2O + 2K_2C_2O_4.HgC_2O_4.3H_2O$ | |
| 35.33 | 0.46 |
| $2K_2C_2O_4.HgC_2O_4.3H_2O + K_2C_2O_4.HgC_2O_4.2H_2O$ | |
| 35.23 | 0.41 |
| $K_2C_2O_4.HgC_2O_4.2H_2O$ | |
| 34.20 | 0.36 |
| 31.89 | 0.33 |
| 29.88 | 0.33 |
| 26.10 | 0.29 |
| 21.89 | 0.26 |
| 19.98 | 0.23 |
| 16.58 | 0.22 |
| $K_2C_2O_4.HgC_2O_4.2H_2O + HgC_2O_4$ | |
| 15.21 | 0.24 |
| $HgC_2O_4$ | |
| 13.50 | 0.20 |
| 10.01 | 0.10 |
| 6.52 | 0.06 |
| 3.85 | 0.02 |
| 1.58 | 0.01 |
| 0.0 | 0.01 |

### $C_2O_4^{--}$ $Y^{+++}$ $K^+$
$H_2O + Y_2(C_2O_4)_3 + K_2C_2O_4$
$t$ = 25°C (302)

| % $K_2C_2O_4$ | % $Y_2(C_2O_4)_3$ |
|---|---|
| $K_2C_2O_4$ | |
| 27.47 | 0 |
| 27.72 | 0.78 |
| 27.84 | 0.97 |

### $C_2O_4^{--}$ $Y^{+++}$ $K^+$.—(*Cont'd*)

| % $K_2C_2O_4$ | % $Y_2(C_2O_4)_3$ |
|---|---|
| $4K_2C_2O_4.Y_2(C_2O_4)_3.12H_2O$ | |
| 27.08 | 1.06 |
| 25.09 | 1.11 |
| 21.44 | 1.11 |
| 22.00 | 1.14 |
| $Y_2(C_2O_4)_3$ | |
| 21.28 | 1.16 |
| 20.43 | 1.08 |
| 16.76 | 0.59 |
| 12.63 | 0.24 |
| 8.15 | 0.06 |
| 5.03 | 0.02 |
| 3.23 | 0.01 |
| 1.29 | 0.0 |

### $C_2O_4^{--}$ $Be^{++}$ (= $Gl^{++}$)
$H_2O + H_2C_2O_4 + BeO + BeC_2O_4$; $t$ = 25°C (361.5)

Gives data for solubility of $BeC_2O_4.3H_2O$ in solutions containing varying concentrations

### $C_2O_4^{--}$ $Be^{++}$.—(*Cont'd*)
of BeO and of $H_2C_2O_4.2H_2O$ and solid solutions composed of $H_2C_2O_4.2H_2O$ and $BeC_2O_4.3H_2O$ in solutions containing $BeC_2O_4$ and $H_2C_2O_4$.

### $C_2O_4^{--}$ $Na^+$ $K^+$
$H_2O + Na_2C_2O_4 + K_2C_2O_4$
$t$ = 25°C (314)

| % $K_2C_2O_4$ | % $Na_2C_2O_4$ |
|---|---|
| $K_2C_2O_4.H_2O$ | |
| 27.2 | 0 |
| 26.3 | 1.71 |
| $K_2C_2O_4.H_2O + Na_2C_2O_4$ | |
| 26.1 | 2.50 |
| $Na_2C_2O_4$ | |
| 19.6 | 3.21 |
| 14.4 | 3.21 |
| 8.10 | 3.40 |
| 3.99 | 3.71 |
| 0 | 3.71 |

### $C_2O_4^{--}$ $Fe^{++}$ $Fe^{+++}$ $K^+$
$H_2O + FeC_2O_4 + Fe_2(C_2O_4)_3 + K_2C_2O_4$
$t$ = 25°C (333)

| Solid phases | Liquid phase | | |
|---|---|---|---|
| | $M_{K_2C_2O_4}$/l | $M_{FeC_2O_4}$/l | $M_{K_3Fe(C_2O_4)_3}$/l |
| $K_2C_2O_4$ | 2.092 | | |
| $K_2C_2O_4 + K_2C_2O_4.FeC_2O_4$ | 2.250 | 0.600 | |
| $FeC_2O_4 + K_2C_2O_4.FeC_2O_4$ | 1.418 | 0.456 | |
| $FeC_2O_4$ | 1.414 | 0.312 | |
| | 0.922 | 0.239 | |
| | 0.457 | 0.070 | |
| | 0.268 | 0.026 | |
| $K_3Fe(C_2O_4)_3$ | | | 0.299 |
| $K_3Fe(C_2O_4)_3 + K_2C_2O_4$ | 1.936 | | 0.068 |
| $K_3Fe(C_2O_4)_3 + FeC_2O_4$ | | 0.005 | 0.299 |
| $K_2C_2O_4 + K_2C_2O_4.FeC_2O_4 + K_3Fe(C_2O_4)_3$ | 1.88 | 0.54 | 0.095 |
| $FeC_2O_4 + K_2C_2O_4.FeC_2O_4 + K_3Fe(C_2O_4)_3$ | 1.43 | 0.45 | 0.140 |

### $C_2O_4^{--}$ $UO_2^{++}$ $Na^+$ (83)
$H_2O + UO_2C_2O_4 + Na_2C_2O_4$

| Solid phases | Liquid phase | | | |
|---|---|---|---|---|
| | $t$ = 15°C | | $t$ = 50°C | |
| | % $UO_2C_2O_4$ | % $Na_2C_2O_4$ | % $UO_2C_2O_4$ | % $Na_2C_2O_4$ |
| $UO_2C_2O_4.3H_2O$ | 0.47 | 0.0 | 1.00 | 0.0 |
| $UO_2C_2O_4.3H_2O + Na_2C_2O_4.4UO_2C_2O_4.11H_2O$ | 2.65 | 0.80 | 3.58 | 1.01 |
| $Na_2C_2O_4.4UO_2C_2O_4.11H_2O + Na_2C_2O_4.UO_2C_2O_4.5H_2O$ | 5.01 | 1.80 | | |
| $Na_2C_2O_4.4UO_2C_2O_4.11H_2O + Na_2C_2O_4.2UO_2C_2O_4.5H_2O$ | | | 9.84 | 3.60 |
| $Na_2C_2O_4.2UO_2C_2O_4.5H_2O + Na_2C_2O_4.UO_2C_2O_4.5H_2O$ | | | 12.33 | 4.62 |
| $Na_2C_2O_4.UO_2C_2O_4.5H_2O + Na_2C_2O_4$ | 3.14 | 4.93 | 13.69 | 9.03 |
| $Na_2C_2O_4$ | 0.0 | 3.09 | 0.0 | 4.28 |

## $CO_3^{--}$ $Na^+$ (141)

$H_2O + NaOH + Na_2CO_3$; *v.* Fig. 162

| Solid phases | Liquid phase | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 15°C | | $t$ = 20°C | | $t$ = 25°C | | $t$ = 30°C | | $t$ = 35°C | | $t$ = 45°C | | $t$ = 60°C | |
| | % $Na_2CO_3$ | % NaOH | % $Na_2CO_3$ | % NaOH | % $Na_2CO_3$ | % NaOH | % $Na_2CO_3$ | % NaOH | % $Na_2CO_3$ | % NaOH | % $Na_2CO_3$ | % NaOH | % $Na_2CO_3$ | % NaOH | % $Na_2CO_3$ | % NaOH |
| | 6.4 | 0.0 | 14.1 | 0.0 | 18.0 | 0.0 | 22.7 | 0.0 | 28.4 | 0.0 | | | | | | |
| $Na_2CO_3.10H_2O$ | 2.6 | 8.1 | 10.1 | 4.8 | 12.9 | 6.3 | 18.2 | 5.4 | 26.5 | 3.1 | | | | | | |
| | 2.2 | 18.4 | 7.5 | 13.8 | 11.6 | 12.7 | 18.1 | 7.0 | | | | | | | | |
| $Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$ | 2.7 | 20.9 | | | | | | | | | | | | | | |
| | 3.1 | 22.3 | 8.9 | 17.0 | 12.4 | 13.4 | 18.0 | 9.3 | 26.7 | 3.5 | | | | | | |
| $Na_2CO_3.7H_2O$ | | | 7.7 | 19.3 | 11.7 | 14.7 | 17.6 | 9.7 | 25.7 | 4.0 | 32.9 | 0.0 | | | | |
| | | | | | | | 16.7 | 10.7 | 24.3 | 5.5 | | | | | | |
| $Na_2CO_3.7H_2O + Na_2CO_3.H_2O$ | 3.1 | 23.0 | 7.9 | 19.4 | 11.1 | 16.2 | 15.4 | 12.7 | 21.9 | 7.9 | 32.0 | 0.6 | | | | |
| | 1.2 | 28.9 | 6.3 | 20.8 | 5.2 | 22.0 | 1.2 | 30.6 | 19.0 | 9.8 | 25.3 | 4.9 | 32.2 | 0.0 | 31.8 | 0.0 |
| | | | 4.1 | 23.9 | 1.1 | 29.3 | 0.5 | 37.5 | 13.7 | 13.8 | 15.2 | 11.9 | 14.5 | 12.1 | 22.5 | 6.1 |
| $Na_2CO_3.H_2O$ | | | 1.2 | 30.6 | 0.3 | 39.8 | | | 0.9 | 31.2 | 7.5 | 18.7 | 1.4 | 28.1 | 14.2 | 12.2 |
| | | | 0.2 | 44.9 | | | | | | | 1.9 | 27.5 | 0.5 | 37.8 | 6.9 | 19.4 |
| | | | | | | | | | | | 0.5 | 34.2 | | | 1.1 | 32.6 |
| $Na_2CO_3.H_2O + Na_2CO_3$ | | | 0.6 | 47.3 | 0.3 | 41.5 | 0.5 | 42.5 | 15.1* | 35.0 | 0.5 | 39.2 | 0.5 | 38.3 | 0.8 | 34.4 |
| | | | 0.7 | 49.8 | 5.4* | 43.9 | 4.5* | 47.1 | 2.5* | 44.5 | 0.2 | 39.5 | 0.5 | 47.0 | 0.7 | 35.4 |
| $Na_2CO_3$ | | | | | 9.6* | 43.8 | | | 6.1* | 49.1 | 0.2 | 44.8 | 0.2 | 52.4 | 0.3 | 42.3 |
| | | | | | | | | | | | 0.2 | 50.2 | | | 0.3 | 52.2 |
| $NaOH.4H_2O$ | 0.0 | 29.6 | | | | | | | | | | | | | | |
| $NaOH.H_2O$ | | | 0.0 | 51.2 | 0.0 | 52.1 | 0.0 | 53.3 | 0.0 | 54.3 | 0.0 | 55.4 | 0.0 | 57.8 | 0.0 | 63.5 |

* Solution not clear.

## $CO_3^{--}$ $Na^+$ $K^+$ (37, 214, 238, 288); for more recent data on the system, *v.* (184.5)

$H_2O + Na_2CO_3 + K_2CO_3$

| Solid phases | Liquid phase | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $t$ = −6°C (214) | | $t$ = 10°C (238) | | $t$ = 24.2°C (238) | | $t$ = 40°C (214) | | $t$ = 25°C (37) | | | | $t$ = 25°C (288) | | | |
| | % $K_2CO_3$ | % $Na_2CO_3$ | % $K_2CO_3$ | % $Na_2CO_3$ | % $K_2CO_3$ | % $Na_2CO_3$ | % $K_2CO_3$ | % $Na_2CO_3$ | % $K_2CO_3$ | % $Na_2CO_3$ | | | % $K_2CO_3$ | % $Na_2CO_3$ | | |
| $K_2CO_3.2H_2O$ | | | | | | | 54.40 | | | | | | | | | |
| | | | | | | | 50.36 | 3.85 | | | | | | | | |
| $K_2CO_3.\frac{3}{2}H_2O$* | | | 52.01 | | 52.95 | | | | 53.17* | | | | 52.82* | | | |
| | | | | | 51.95 | 1.19 | | | | | | | | | | |
| $K_2CO_3.\frac{3}{2}H_2O + KNaCO_3.6H_2O$ | | | 49.80 | 2.89 | 49.77 | 4.37 | | | 48.44 | 5.06 | | | 49.0 | 4.60 | | |
| $K_2CO_3.2H_2O + KNaCO_3.6H_2O$ | | | | | | | 49.04 | 5.13 | | | | | | | | |
| | 26.31 | 4.63 | 31.09 | 6.73 | 46.34 | 6.50 | | | 43.12 | 5.31 | | | 41.0 | 6.3 | | |
| | | | 23.13 | 11.52 | 44.92 | 6.34 | 47.59 | 5.32 | 32.10 | 10.45 | | | 31.0 | 10.5 | | |
| $KNaCO_3.6H_2O$ | | | | | 28.96 | 11.20 | 42.80 | 8.02 | 16.99 | 21.38 | | | 22.4 | 16.6 | | |
| | | | | | 21.37 | 16.91 | 27.60 | 15.48 | | | | | | | | |
| | | | | | 17.52 | 20.50 | 19.47 | 20.04 | | | | | | | | |
| | | | | | | | 14.85 | 22.77 | | | | | | | | |
| $KNaCO_3.6H_2O + Na_2CO_3.H_2O$ | | | | | | | 12.96† | 25.30† | | | | | | | | |
| $Na_2CO_3.H_2O$ | | | | | | | 9.61 | 27.21 | | | | | | | | |
| | | | | | | | 6.47 | 28.85 | | | | | | | | |
| $K_2CO_3.3.75H_2O$ | 45.79 | | | | | | | | | | | | | | | |
| $KNaCO_3.6H_2O + Na_2CO_3.7H_2O$ | | | | | | | | | 18.35 | 21.42 | | | 15.1 | 23.2 | | |
| $KNaCO_3.6H_2O + K_2CO_3.3.75H_2O$ | 33.56 | 4.29 | | | | | | | | | | | | | | |
| $KNaCO_3.6H_2O + Na_2CO_3.10H_2O$ | 18.53 | 8.53 | | | | | | | | | | | | | | |
| $Na_2CO_3.7H_2O$ | | | | | | | | | 15.32 | 22.06 | | | | | | |
| $Na_2CO_3.7H_2O + Na_2CO_3.10H_2O$ | | | | | | | | | 12.26 | 23.05 | | | 14.5 | 22.8 | | |
| $KNaCO_3.6H_2O + Na_2CO_3.10H_2O$ | | | | | 14.81† | 23.47† | | | | | | | | | | |
| | | | | | 14.19 | 23.16 | | | 7.70 | 22.24 | | | 10.7 | 22.4 | | |
| $Na_2CO_3.10H_2O$ | | | | 10.69 | 9.99 | 23.55 | | | 1.17 | 22.45 | | | 4.7 | 21.9 | | |
| | | | | | | 22.19 | | | | 22.95 | | | | 22.71 | | |

* Osaka (288) reports the solid to have the formula $K_2CO_3.2H_2O$ instead of $K_2CO_3.\frac{3}{2}H_2O$. He reports the solid phases in equilibrium with the solution to be $KNaCO_3.6H_2O$ and $Na_2CO_3.10H_2O$. He does not report $Na_2CO_3.7H_2O$ at this temperature.

† By graphical interpolation.

### $C_2O_4^{--}$ $K^+$ (165): $H_2O + H_2C_2O_4 + K_2C_2O_4$

| Solid phases | Liquid phase, $t$ = 25°C: % $C_2O_3$ | % $K_2O$ |
|---|---|---|
| $C_2O_3.3H_2O$ | 8.290 | 0 |
| $C_2O_3.3H_2O + \frac{1}{2}K_2O.2C_2O_3.\frac{1}{2}H_2O$ | 8.278 | 0.045 |
| $\frac{1}{2}K_2O.2C_2O_3.\frac{7}{2}H_2O$ | 2.827 | 0.238 |
| | 1.790 | 0.555 |
| | 2.675 | 1.714 |
| $\frac{1}{2}K_2O.2C_2O_3.\frac{7}{2}H_2O + \frac{1}{2}K_2O.C_2O_3.\frac{1}{2}H_2O$ | 3.450 | 2.360 |
| $\frac{1}{2}K_2O.C_2O_3.\frac{1}{2}H_2O$ | 5.457 | 5.919 |
| $\frac{1}{2}K_2O.C_2O_3.\frac{1}{2}H_2O + 2K_2O.3C_2O_3.3H_2O$ | 9.816 | 11.960 |
| $2K_2O.3C_2O_3.3H_2O + K_2O.C_2O_3.H_2O$ | 12.365 | 15.71 |
| $K_2O.C_2O_3.H_2O$ | 11.85 | 15.51 |

At *ca.* 64°C, $2KHC_2O_4.H_2O \leftrightarrow KHC_2O_4$.

### $C_2H_3O_2^-$ $C_4H_4O_6^{--}$ $Ca^{++}$ $K^+$

$H_2O + HC_2H_3O_2 + Ca(C_2H_3O_2)_2 + K_2C_4H_4O_6$; $t$ = 25°C (172)

| g $KC_2H_3O_2$/l* | g CaO/l* $CaC_4H_4O_6$† |
|---|---|
| 0.0 | 0.5033 |
| 0.4905 | 0.4530 |
| 0.9810 | 0.4220 |
| 1.9620 | 0.3706 |
| 4.905 | 0.3273 |
| 9.810 | 0.3047 |
| 29.430 | 0.3600 |
| 49.050 | 0.4526 |

* Solution contained 18.23 g HCl per l at all determinations.

† Authors do not give actual composition of solid used.

### $C_2H_3O_2^-$ $HC_4H_4O_6^-$ $K^+$

$H_2O + KC_2H_3O_2 + KHC_4H_4O_6$; $t$ = 25°C (283)

| $M_{KC_2H_3O_2}$/l* | $M_{KHC_4H_4O_6}$/l* $KHC_4H_4O_6$ |
|---|---|
| 0 | 0.0347 |
| 0.05 | 0.0410 |
| 0.10 | 0.0504 |
| 0.20 | 0.0634 |

* Determinations mean of two results.

### $C_2H_3O_2^-$ $Pb^{++}$

$H_2O + Pb(OH)_2 + Pb(C_2H_3O_2)_2$; $t$ = 25°C (218)

| % $Pb(C_2H_3O_2)_2$ | % PbO |
|---|---|
| $Pb(C_2H_3O_2)_2.3H_2O$ | |
| 35.19 | −0.27* |
| 37.14 | +1.01 |
| 41.95 | 6.01 |
| 47.88 | 14.22 |
| $Pb(C_2H_3O_2)_2.3H_2O + 3Pb(C_2H_3O_2)_2.PbO.3H_2O$ | |
| 48.95 | 15.89 |
| $3Pb(C_2H_3O_2)_2.PbO.3H_2O$ | |
| 48.85 | 16.27 |
| 48.71 | 18.83 |
| 48.96 | 22.94 |
| 49.01 | 23.53 |

### $C_2H_3O_2^-$ $Pb^{++}$.—(*Continued*)

| % $Pb(C_2H_3O_2)_2$ | % PbO |
|---|---|
| $3Pb(C_2H_3O_2)_2.PbO.3H_2O + Pb(C_2H_3O_2)_2.2PbO.4H_2O$ | |
| 49.21† | 24.74† |
| $Pb(C_2H_3O_2)_2.2PbO.4H_2O$ | |
| 43.17 | 23.59 |
| 40.78 | 22.78 |
| 29.63 | 18.73 |
| 20.96 | 14.62 |
| 12.99 | 10.66 |
| 5.36 | 7.84 |
| $Pb(OH)_2$ | |
| 4.71 | 7.17 |
| 4.25 | 6.54 |
| 3.40 | 5.29 |
| 0.11 | 0.20 |

$t$ = ? (321)

| M% $HC_2H_3O_2$ | M% PbO PbO |
|---|---|
| 0.20 | 1.0 |
| 0.48 | 1.07 |
| 0.54 | 1.05 |
| $Pb(C_2H_3O_2)_2.2Pb(OH)_2$ | |
| 1.03 | 1.45 |
| 2.51 | 2.89 |
| 4.17 | 3.78 |
| 5.61 | 5.20 |
| $Pb(C_2H_3O_2)_2.2Pb(OH)_2 + Pb(OH)C_2H_3O_2$ | |
| 7.26 | 7.15 |
| $Pb(OH)C_2H_3O_2$ | |
| 7.79 | 6.51 |
| 7.72 | 5.59 |
| $Pb(OH)C_2H_3O_2 + Pb(C_2H_3O_2)_2.3H_2O$ | |
| 7.92 | 5.18 |
| $Pb(C_2H_3O_2)_2.3H_2O$ | |
| 7.30 | 4.38 |
| 5.36 | 3.34 |
| 13.07 | 3.16 |
| 16.78 | 3.80 |
| 21.53 | 4.18 |

* Acidity expressed in terms of PbO.

† Mean of two results.

### $C_2H_3O_2^-$ $Pb^{++}$ $K^+$

$H_2O + Pb(C_2H_3O_2)_2 + KC_2H_3O_2$; $t$ = 25°C (140)

| % $KC_2H_3O_2$ | % $Pb(C_2H_3O_2)_2$ $Pb(C_2H_3O_2)_2.3H_2O$ |
|---|---|
| 0 | 35.90 |
| 15.40 | 36.91 |
| 13.87 | 38.05 |

### $C_2H_3O_2^-$ $Pb(N_3)_2$ $Na^+$; *v.* p. 356

### $C_2H_3O_2^-$ $BO_3^{---}$

$H_2O + HC_2H_3O_2 + H_3BO_3$; $t$ = 30°C (113)

| % $B_2O_3$ | % $(CH_3CO)_2O$ $B(OH)_3$ |
|---|---|
| 3.55 | 0.0 |
| $B(OH)_3$? | |
| 0.45 | 84.55 |
| $B_2O_3.2(CH_3CO)_2O$ | |
| 4.98 | 82.13 |
| $B_2O_3.2(CH_3CO)_2O + B_2O_3.3(CH_3CO)_2O$ | |
| 5.00 | 87.80 |
| $B_2O_3.3(CH_3CO)_2O$ | |
| 4.18 | 91.16 |
| 3.53 | 95.40 |

### $C_2H_3O_2^-$ $Mg^{++}$

$H_2O + HC_2H_3O_2 + Mg(OH)_2$; $t$ = 25°C (216)

| % $HC_2H_3O_2$ | % MgO MgO |
|---|---|
| 3.36 | 1.73 |
| 8.06 | 4.21 |
| 12.46 | 6.54 |
| $MgO + Mg(C_2H_3O_2)_2.4H_2O$ | |
| 15.46 | 8.24 |
| $Mg(C_2H_3O_2)_2.4H_2O$ | |
| 14.25 | 7.24 |
| 20.19 | 7.47 |
| 22.93 | 7.60 |
| 26.61 | 7.74 |
| 31.37 | 7.99 |
| $Mg(C_2H_3O_2)_2.4H_2O + 2Mg(C_2H_3O_2)_2.3HC_2H_3O_2.3H_2O$ | |
| 36.23 | 8.18 |
| $2Mg(C_2H_3O_2)_2.3HC_2H_3O_2.3H_2O$ | |
| 40.87 | 7.42 |
| 47.86 | 6.74 |
| 56.16 | 5.81 |
| 61.59 | 4.68 |
| 65.19 | 4.36 |
| 69.13 | 3.75 |
| 75.93 | 2.85 |
| 82.90 | 2.23 |

### $C_2H_3O_2^-$ $Ba^{++}$

$H_2O + HC_2H_3O_2 + Ba(C_2H_3O_2)_2$; $t$ = 25°C (216)

| % $HC_2H_3O_2$ | % $Ba(C_2H_3O_2)_2$ $Ba(C_2H_3O_2)_2.3H_2O$ |
|---|---|
| 0 | 5.18 |
| 0.41 | 5.21 |
| $Ba(C_2H_3O_2)_2.3H_2O + 3Ba(C_2H_3O_2)_2.3HC_2H_3O_2.11H_2O$ | |
| 1.40 | 5.34 |
| $3Ba(C_2H_3O_2)_2.3HC_2H_3O_2.11H_2O$ | |
| 2.42 | 4.03 |
| 5.61 | 3.04 |
| 16.92 | 3.24 |
| 26.48 | 4.41 |
| 33.14 | 5.23 |
| 42.08 | 7.85 |
| $3Ba(C_2H_3O_2)_2.3HC_2H_3O_2.11H_2O + Ba(C_2H_3O_2)_2.2HC_2H_3O_2$ | |
| 46.51 | 8.87 |
| $Ba(C_2H_3O_2)_2.2HC_2H_3O_2$ | |
| 46.49 | 9.10 |
| 51.98 | 8.62 |
| 58.35 | 8.72 |
| 65.77 | 8.40 |
| 77.06 | 7.79 |
| 85.27 | 7.36 |

Transition temperature, $Ba(C_2H_3O_2)_2.3H_2O + Ba(C_2H_3O_2)_2.H_2O$ at 24.7°C (392).

### $C_2H_3O_2^-$ $Na^+$; *v.* p.375

### $HC_4H_4O_6^-$ $K^+$

$H_2O + d\text{-}KHC_4H_4O_6 + l\text{-}KHC_4H_4O_6$; $t$ = 20°C (48)

| g *d*-$KHC_4H_4O_6$/l | g *l*-$KHC_4H_4O_6$/l |
|---|---|
| *dl*-$KHC_4H_4O_6$ | |
| 2.513 | 2.513 |
| 3.040 | 2.100 |
| 3.578 | 1.698 |
| 4.203 | 1.383 |
| 4.825 | 1.065 |
| 5.568 | 0.868 |
| *d*-$KHC_4H_4O_6$ | |
| 5.040 | 0.940 |
| 5.260 | 0.470 |
| 5.440 | 0.0 |

$C_2H_3O_2^-$ $Na^+$ (113, 114): $H_2O + HC_2H_3O_2 + NaOH$; *v.* Fig. 163*

| Solid phases | Liquid phase—g per 100g $H_2O$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t$ = 0°C | | $t$ = 15°C | | $t$ = 30°C | | $t$ = 45°C | |
| | $Na_2O$ | $(CH_3CO)_2O$ | $Na_2O$ | $(CH_3CO)_2O$ | $Na_2O$ | $(CH_3CO)_2O$ | $Na_2O$ | $(CH_3CO)_2O$ |
| $NaC_2H_3O_2$ | | | 29.34 | 0.15 | 35.31 | 0.77 | 39.82 | 0.77 |
| | | | | | 26.25 | 8.92 | 32.69 | 2.04 |
| | | | | | | | 25.58 | 14.29 |
| | 24.12 | 2.04 | 25.94 | 4.19 | 25.98 | 9.06 | 23.12 | 18.70 |
| $NaC_2H_3O_2.3H_2O$ | 19.82 | 3.83 | 22.24 | 4.88 | 18.09 | 13.62 | 22.46 | 18.85 |
| | 9.82 | 24.56 | 15.49 | 12.01 | 13.53 | 21.88 | 21.12 | 19.44 |
| | 9.75 | 40.0 | 11.45 | 23.54 | | | 16.04 | 26.39 |
| $NaC_2H_3O_2.3H_2O + NaC_2H_3O_2.HC_2H_3O_2$ | 9.77 | 41.23 | 11.25 | 34.56 | 13.24 | 33.05 | 16.00 | 33.87 |
| $NaC_2H_3O_2.HC_2H_3O_2$ | 9.04 | 43.94 | 10.24 | 39.73 | 7.64 | 65.07 | 10.84 | 51.00 |
| | | | 9.16 | 49.32 | | | 9.04 | 65.11 |
| $NaC_2H_3O_2.HC_2H_3O_2 + NaC_2H_3O_2.2HC_2H_3O_2$ | 8.96 | 44.80 | 8.56 | 54.34 | 7.67 | 66.42 | | |
| | 7.83 | 50.03 | 6.17 | 68.81 | 6.94 | 71.39 | 5.54 | 82.16 |
| $NaC_2H_3O_2.2HC_2H_3O_2$ | 6.26 | 60.64 | 5.52 | 73.02 | 5.52 | 77.76 | 4.25 | 85.38 |
| | 4.02 | 79.29 | 2.87 | 86.61 | 2.94 | 86.73 | 2.36 | 94.23 |
| | 0.57 | 96.16 | 0.79 | 98.09 | 1.27 | 94.78 | | |

* The lines separating the fields of this diagram and the transition points indicated are all approximations.

$HC_4H_4O_6^-$ $C_{21}H_{23}N_2O_2^+$ (115)

$H_2O$ + Strychnine *l*-tartrate + Strychnine *d*-tartrate

| Solid phases | Liquid phase | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $t$ = 7.35°C | | $t$ = 16°C | | $t$ = 25°C | | $t$ = 40°C | |
| | % *l*-tartrate | % *d*-tartrate | % *l*-tartrate | % *d*-tartrate | % *l*-tartrate | % *d*-tartrate | % *l*-tartrate | % *d*-tartrate |
| | 0.939 | | 1.136 | | 1.428 | | 2.238 | |
| | 0.834 | 0.259 | 0.962 | 0.351 | 1.240 | 0.453 | 1.925 | 0.689 |
| *l*-Tartrate | 0.733 | 0.519 | 0.837 | 0.702 | 1.087 | 0.906 | 1.795 | 1.151 |
| | 0.670 | 0.778m | 0.727 | 1.055 | 0.937 | 1.361 | 1.737 | 1.382 |
| | | | | | | | 1.651 | 1.730 |
| | | | | | | | 1.596 | 2.802 |
| | 0.593 | 0.904m | 0.911 | 0.970 | 0.856 | 1.561m | 1.678 | 2.129 |
| | 0.394 | 1.050m | 0.682 | 1.132 | 0.570 | 1.788m | 1.116 | 2.460 |
| *d*-Tartrate | 0.197 | 1.224 | 0.226 | 1.503 | 0.285 | 2.164 | 0.892 | 2.633 |
| | | 1.393 | | 1.741 | | 2.236 | 0.444 | 2.984 |
| | | | | | | | | 3.397 |
| Racemate | 1.381 (% r) | | 1.876 (% r) | | 2.408 (% r) | | 3.706 (% r) | |
| *d*-Tartrate + *l*-Tartrate | 1.487 (% $d + l$) | | 1.928 (% $d + l$) | | 2.442 (% $d + l$) | | 3.832 (% $d + l$) | |
| *d*-Tartrate + Racemate | 1.477 (% $d$ + r) | | 1.767 (% $d$ + r) | | 2.348 (% $d$ + r) | | | |
| *l*-Tartrate + Racemate | 1.380 (% $l$ + r) | | 1.821 (% $l$ + r) | | 2.340 (% $l$ + r) | | | |
| | $t$ = 8.9°C | | $t$ = 30°C | | $t$ = 32°C | | | |
| *d*-Tartrate + *l*-Tartrate | | | 2.741 (% $d + l$) | | 2.962 (% $d + l$) | | | |
| Racemate | 1.481 (% r) | | | | | | | |
| *l*-Tartrate + Racemate | 1.422 (% $l$ + r) | | 2.736 (% $l$ + r) | | 2.467 (% $l$ + r) | | | |

*dl*-$C_4H_4O_6^-$ – $Na^+$ $K^+$ (196): $H_2O$ + *dl*-$Na_2C_4H_4O_6$ + *dl*-$K_2C_4H_4O_6$

| °C | Solid phases | Liquid phase—M per 1000M $H_2O$ | | | Transition points | |
|---|---|---|---|---|---|---|
| | | A* | B* | C* | °C | Solid phases |
| 9.7 | $(NaKC_4H_4O_6.3H_2O)_2$ | 49.6 | | | −6 | $(NaKC_4H_4O_6.4H_2O)_2$ Tartrate + $(NaKC_4H_4O_6.3H_2O)_2$ Racemate |
| 29.5 | | 79.0 | | | | |
| 41 | $(NaKC_4H_4O_6.3H_2O)_2$ + $(Na_2C_4H_4O_6)_2$ + $(K_2C_4H_4O_6.2H_2O)_2$ | | 21.7 | 56.9 | 33 | $(NaKC_4H_4O_6.4H_2O)_2$ Tartrate + $(Na_2C_4H_4O_6)_2$ + $(K_2C_4H_4O_6.2H_2O)_2$ |

*A = $NaKC_4H_4O_6$; B = $Na_2C_4H_4O_6$; C = $K_2C_4H_4O_6$.

### $C_4H_4O_6^{--}$ $Na^+$ $K^+$ (245)

$H_2O + Na_2C_4H_4O_6 + K_2C_4H_4O_6$

| °C | Solid phases | Liquid phase* % $K_2C_4H_4O_6$ | Liquid phase* % $Na_2C_4H_4O_6$ |
|---|---|---|---|
| 18 | $NaKC_4H_4O_6.4H_2O$ | 19.20 | 16.50 |
| 20.9 | $Na_2C_4H_4O_6.2H_2O + NaKC_4H_4O_6.4H_2O$ | 11.80 | 27.85 |
| 26.6 | $K_2C_4H_4O_6.\frac{1}{2}H_2O + NaKC_4H_4O_6.4H_2O$ | 56.05 | 4.25 |
| 38 | $Na_2C_4H_4O_6.2H_2O + NaKC_4H_4O_6.4H_2O$ | 25.80 | 24.70 |
| 38 | $KNaC_4H_4O_6.4H_2O$ | 26.60 | 22.80 |
| 48.3 | $K_2C_4H_4O_6.\frac{1}{2}H_2O + NaKC_4H_4O_6.4H_2O$ | 51.65 | 13.20 |
| 50 | $Na_2C_4H_4O_6.2H_2O + NaKC_4H_4O_6.4H_2O$ | 36.70 | 23.85 |
| 59.7 | $Na_2C_4H_4O_6.2H_2O + K_2C_4H_4O_6.\frac{1}{2}H_2O$ | 44.50 | 25.30 |
| 80 | $Na_2C_4H_4O_6.2H_2O + K_2C_4H_4O_6.\frac{1}{2}H_2O$ | 39.70 | 34.70 |

* Most of these figures represent the mean of two determinations.

### $C_7H_5O_3^-$ (salicylate ion) $Na^+$

$H_2O + C_7H_6O_3 + NaC_7H_5O_3$

$t$ = 20.1°C (211)

| $M_{C_7H_6O_3}$/l | $M_{C_7H_5O_3Na}$/l |
|---|---|
| $C_7H_6O_3$ | |
| 0.0132 | 0.000 |
| 0.0117 | 0.006 |
| 0.0124 | 0.113 |
| 0.0135 | 0.175 |
| 0.0148 | 0.257 |
| 0.0164 | 0.344 |
| 0.0186 | 0.422 |
| 0.0242 | 0.682 |
| 0.0312 | 0.94 |
| 0.062 | 1.70 |
| $C_7H_6O_3 + C_7H_6O_3.C_7H_5O_3Na$ | |
| 0.095 | 2.11 |
| $C_7H_6O_3.C_7H_5O_3Na$ | |
| 0.091 | 2.19 |
| 0.087 | 2.40 |
| 0.086 | 3.41 |
| 0.085 | 3.80 |
| $C_7H_6O_3.C_7H_5O_3Na$ + $C_7H_5O_3Na.6H_2O$ | |
| 0.082 | 4.215 |
| $C_7H_5O_3Na.6H_2O$ | |
| 0.048 | 4.18 |
| 0.021 | 4.12 |
| 0.000 | 4.165 |

### $CN^-$ $Tl^+$ $K^+$

$H_2O + TlCN + KCN$

$t$ = 25°C (25)

| % KCN | % TlCN |
|---|---|
| KCN | |
| 41.70 | 0.0 |
| 40.83 | 0.71 |
| 39.76 | 1.65 |
| $KCN + KTl(CN)_2$ | |
| 37.02* | 3.17* |
| $KTl(CN)_2$ | |
| 37.50 | 3.11 |
| 36.52 | 4.12 |
| 35.93 | 5.78 |
| TlCN | |
| 36.00 | 4.99 |
| 35.27 | 4.98 |
| 34.36 | 4.90 |
| 31.25 | 4.46 |
| 30.21 | 5.00 |
| 28.07 | 4.47 |
| 21.00 | 4.36 |
| 14.75 | 5.46 |
| 9.12 | 7.17 |
| 0.51 | 16.20 |
| 0.34 | 16.12 |
| 0.0 | 15.61* |

* Mean of two determinations.

### $HC_4H_4O_6^-$ $C_{23}H_{27}N_2O_4^+$ (115)

$H_2O$ + Brucine $d$-tartrate + Brucine $l$-tartrate

| Solid phases | Liquid phase $t$ = 20°C % $l$-tartrate | $t$ = 20°C % $d$-tartrate | $t$ = 25°C % $l$-tartrate | $t$ = 25°C % $d$-tartrate | $t$ = 35°C % $l$-tartrate | $t$ = 35°C % $d$-tartrate | $t$ = 44°C % $l$-tartrate | $t$ = 44°C % $d$-tartrate | $t$ = 50°C % $l$-tartrate | $t$ = 50°C % $d$-tartrate |
|---|---|---|---|---|---|---|---|---|---|---|
| $d$-Tartrate | | | | 0.996 | | 1.255 | | 1.563 | | 1.822 |
| $l$-Tartrate | | | 1.81 | | 3.14 | | 4.44 | | 6.15 | |
| $l$-Tartrate + $d$-Tartrate | 1.374(% $d + l$) | | 1.723(% $d + l$) | | 2.95(% $d + l$) | | 5.3(% $d + l$) | | 7.04(% $d + l$) | |

### $CN^-$ $Cu^+$ $K^+$

$H_2O + CuCN + KCN$; *v.* Fig. 164

$t$ = 25°C (25)

| | Solid phases | Liquid phase % CuCN | Liquid phase % KCN |
|---|---|---|---|
| | CuCN | Tr. | Tr. |
| A | $CuCN + KCu_2(CN)_3.H_2O$ | Tr. | 0.42* |
| | $KCu_2(CN)_3.H_2O$ | 0.60 | 1.34 |
| | | 1.68 | 3.27 |
| | | 1.87 | 4.21 |
| | | 3.88 | 6.03 |
| B | | 7.52 | 9.97 |
| | | 8.84 | 12.10 |
| | $KCu(CN)_2$ | 13.78 | 19.95 |
| | | 14.71 | 22.32 |
| C | | 22.59 | 34.77 |
| | | 22.52 | 35.28 |
| D | $K_3Cu(CN)_4.H_2O$ | 18.47 | 34.82 |
| E | | 12.92 | 36.24 |
| F | | 6.13 | 41.94 |
| | | 15.30 | 33.86 |
| | $K_3Cu(CN)_4$ | 10.86 | 35.96 |
| | | 5.84 | 41.70 |
| | | 4.20 | 40.31 |
| | KCN | 2.16 | 40.53 |
| G | | | 41.70 |

* Mean of six determinations.

### $CN^-$ $Ag^+$ $K^+$

$H_2O + AgCN + KCN$; *v.* Fig. 165

$t$ = 25°C (25)

| | Solid phases | Liquid phase % KCN | Liquid phase % AgCN |
|---|---|---|---|
| A | | 41.70 | |
| | KCN | 40.77 | 6.52 |
| | | 39.91 | 8.14 |
| B | | 40.24 | 10.93 |
| | | 40.44 | 13.71 |
| | $K_3Ag(CN)_4.H_2O$ | 37.76 | 18.92 |
| C | | 35.19 | 25.18 |
| | | 28.43 | 26.37 |
| D | $KAg(CN)_2$ | 26.67 | 24.71 |
| | | 20.14 | 21.66 |
| E | | 8.56 | 16.11 |
| F | | 8.05 | 15.76 |
| | $KAg_2(CN)_3.H_2O$ | 8.93 | 17.73 |
| | | 6.75 | 13.53 |
| | | 2.36 | 4.42 |
| | AgCN | 1.64 | 3.27 |
| G | | 1.26 | 2.31 |
| | | 0.17 | Tr. |

**$CN^-$ $Au^+$ $K^+$**
$H_2O$ + AuCN + KCN
$t$ = 25°C (25)

| % AuCN | % KCN |
|---|---|
| AuCN | |
| 6.12 | 2.37 |
| 7.32 | 2.32 |
| 7.27 | 2.60 |
| AuCN + $KAu(CN)_2$ | |
| 15.47 | 4.78 |
| $KAu(CN)_2$ | |
| 11.02 | 5.19 |
| 8.34 | 7.02 |
| 2.97 | 9.66 |
| 2.55 | 13.70 |
| 0.27 | 23.79 |
| 0.76 | 24.04 |
| 0.35 | 38.98 |
| $KAu(CN)_2$ + KCN | |
| 0.17 | 41.98 |
| KCN | |
| | 41.70 |
| Tr. | 42.02 |

**$CNS^-$ $Ag^+$ $K^+$**
$H_2O$ + AgCNS + KCNS
$t$ = 25°C (131)

| % KCNS | % AgCNS |
|---|---|
| KCNS | |
| 70.53 | 0.0 |
| KCNS + 2KCNS.AgCNS | |
| 66.55 | 9.32 |
| 2KCNS.AgCNS | |
| 64.47 | 10.62 |
| 61.25 | 11.76 |
| 58.34 | 13.55 |
| 53.21 | 17.53 |

**$CNS^-$ $Ag^+$ $K^+$.** —(*Continued*)

| % KCNS | % AgCNS |
|---|---|
| 2KCNS.AgCNS + KCNS.-AgCNS | |
| 50.68 | 20.43 |
| KCNS.AgCNS | |
| 49.43 | 20.32 |
| 32.51 | 18.34 |
| 24.68 | 16.41 |
| KCNS.AgCNS + AgCNS | |
| 23.86 | 16.08 |

**$C_9H_8NO_3^-$ $K^+$**
$H_2O$ + $C_9H_9NO_3$ (hippuric acid) + $C_9H_8KNO_3$
$t$ = 20.1°C (211)

| $M_{C_9H_9NO_3}$/l | $M_{C_9H_8NO_3K}$/l |
|---|---|
| $C_9H_9NO_3$ | |
| 0.0182 | 0.0 |
| 0.0163 | 0.011 |
| 0.0183 | 0.071 |
| 0.0218 | 0.198 |
| 0.0272 | 0.394 |
| 0.061 | 1.39 |
| 0.068 | 1.44 |
| 0.122 | 2.13 |
| $C_9H_9NO_3$ + $C_9H_9NO_3$.-$C_9H_8NO_3K$.?$H_2O$ | |
| 0.150* | 2.45* |
| $C_9H_9NO_3$.$C_9H_8NO_3K$.?$H_2O$ | |
| 0.133 | 2.50 |
| 0.091 | 2.96 |
| $C_9H_9NO_3$.$C_9H_8NO_3K$.-?$H_2O$ + $C_9H_8NO_3K$ | |
| 0.0665* | 3.575* |
| $C_9H_8NO_3K$ | |
| 0.031 | 3.56 |
| 0.011 | 3.55 |
| 0.0 | 3.555* |

* Mean of two results.

**$Zn^{++}$ $CrO_4^{--}$: $H_2O$ + ZnO + $H_2CrO_4$**
$t$ = 25°C (153)

| g $CrO_3$/l | g ZnO/l | g $CrO_3$/l | g ZnO/l |
|---|---|---|---|
| 4ZnO.$CrO_3$.3$H_2O$ + ? | | 4ZnO.2$CrO_3$.3$H_2O$ | |
| 0.010* | 0.013* | 151.0 | 66.10 |
| 4ZnO.$CrO_3$.3$H_2O$ | | 4ZnO.2$CrO_3$.3$H_2O$ + 3ZnO.-2$CrO_3$.$H_2O$ | |
| 0.604 | 0.409 | | |
| 4.190 | 2.240 | 192.0* | 83.70* |
| 4ZnO.$CrO_3$.3$H_2O$ + 3ZnO.-$CrO_3$.2$H_2O$ | | 3ZnO.2$CrO_3$.$H_2O$ | |
| | | 285.0 | 123.0 |
| 11.45* | 5.865* | 450.0 | 193.0 |
| 3ZnO.$CrO_3$.2$H_2O$ | | 3ZnO.2$CrO_3$.$H_2O$ + ZnO.-$CrO_3$.$H_2O$ | |
| 22.20 | 10.70 | | |
| 57.50 | 26.70 | 462.0* | 196.5* |
| 3ZnO.$CrO_3$.2$H_2O$ + 4ZnO.-2$CrO_3$.3$H_2O$ | | ZnO.$CrO_3$.$H_2O$ | |
| | | 475.0 | 202.0 |
| 66.60* | 30.35* | 769.0 | 318.0 |
| 4ZnO.2$CrO_3$.3$H_2O$ | | 970.0 | 389.0 |
| 70.60 | 32.20 | | |

* Mean of two or more results.

**$ZnO^-$ $Na^+$**
$H_2O$ + ZnO + NaOH
$t$ = 30°C (151); *v.* Fig. 167

| | Solid phases | Liquid phase % $Na_2O$ | Liquid phase % ZnO |
|---|---|---|---|
| A | $Na_2O.3H_2O$ | 41.9 | 0 |
| | | 40.7 | 2.0 |
| B | $Na_2O.ZnO.4H_2O$ + $Na_2O.3H_2O$ | 39.2 | 9.70 |
| C | $Na_2O.ZnO.4H_2O$ | 33.2 | 11.2 |
| D | ZnO + $Na_2O.ZnO.4H_2O$ | 27.8 | 16.5 |
| E | ZnO | 24.6 | 12.6 |
| | | 11.8 | 2.6 |
| | $Zn(OH)_2$ | 19.9m | 15.2m |
| | | 13.7 | 7.2 |
| | | 10.1 | 4.7 |
| | | 4.6 | 1.0 |

**$C_{20}H_{12}O_4^{--}$ $C_{20}H_{13}O_4^-$ $Na^+$ (26)**
$H_2O$ + Phenolphthalein + NaOH; *v.* Fig. 166

| | Solid phases | Liquid phase, 25°C % $Na_2O$ | Liquid phase, 25°C % $C_{20}H_{12}O_4$ |
|---|---|---|---|
| B | $C_{20}H_{12}O_3$ + $C_{20}H_{13}O_4Na.4H_2O$ | 6.40 | 33.50 |
| C | $C_{20}H_{13}O_4Na.4H_2O$ + $C_{20}H_{12}O_4Na_2.8H_2O$ | 10.06 | 44.06 |
| D | $C_{20}H_{13}O_4Na.8H_2O$ | 6.95 | 36.06 |
| E | $C_{20}H_{13}O_4Na.8H_2O$ | 8.32 | 41.16 |
| F | $C_{20}H_{12}O_4Na_2.8H_2O$ + $C_{20}H_{11}O_4Na_3.14H_2O$ | 10.00 | 33.50 |
| G | $C_{20}H_{12}O_4Na_2.4H_2O$ | 11.67 | 37.79 |
| H | $C_{20}H_{12}O_4Na_2.4H_2O$ | 11.98 | 34.68 |
| I | $C_{20}H_{12}O_4Na_2$ | 11.00 | 45.55 |
| J | $C_{20}H_{12}O_4Na_2$ | 12.31 | 40.16 |
| K | $C_{20}H_{11}O_4Na_3.14H_2O$ + $C_{20}H_{11}O_4Na_3.13H_2O$ | 13.60 | 22.50 |
| L | $C_{20}H_{11}O_4Na_3.13H_2O$ + $C_{20}H_{11}O_4Na_3.12H_2O$ | 19.50 | 9.50 |
| M | $C_{20}H_{11}O_4Na_3.12H_2O$ + $C_{20}H_{11}O_4Na_3.6H_2O$ | 26.60 | 0.75 |

**$ZnO^-$ $K^+$**
$H_2O$ + ZnO + KOH
$t$ = room (230)

| $M_{KOH}$/l | $M_{Zn}$/l |
|---|---|
| $K_2Zn_2O_3$ | |
| 2.78 | 0.540 |
| 2.38 | 0.405 |
| 2.28 | 0.368 |
| 2.02 | 0.330 |
| 1.81 | 0.272 |
| 1.63 | 0.266 |
| 1.56 | 0.223 |
| 1.42 | 0.209 |
| 0.90 | 0.100 |

**$Pb^{++}$ $CrO_4^{--}$**
$H_2O$ + $Pb(OH)_2$ + $H_2CrO_4$
$t$ = 25°C (90)

| $M_{CrO_3}$/l | |
|---|---|
| $CrO_3$ + $PbCr_2O_7$ | |
| 10.79 | |
| $PbCr_2O_7$ | |
| 8.196 | |
| $PbCr_2O_7$ + $PbCrO_4$ | |
| 6.865 | |

**$Pb^{++}$ $CrO_4^{--}$.**—(*Continued*)

| $M_{CrO_3}$/l | |
|---|---|
| $PbCrO_4$ | |
| 6.04 | |
| 4.90 | |
| 2.95 | |
| 1.22 | |
| 0.49 | |
| 0.08 | |
| 0.013 | |
| 0.0005 | |
| $PbCrO_4$ + 2PbO.$CrO_3$ | |
| 0.00002 | |

**$PbO^-$ $Na^+$**
$Pb(OH)_2$ + NaOH
$t$ = 20°C(8)

| $M_{PbO}$/l* | $M_{NaOH}$/l |
|---|---|
| PbO (yellow) | |
| 0.0237 | 1.00 |
| PbO (red) | |
| 0.0140 | 1.00 |

* Glasstone (147) determined solubility of a hydrate of PbO in solutions of NaOH of varying concentrations; for 0.9985*N* at 25°C, he obtained 0.062M PbO per liter.

**$Th^{++++}$ $CrO_4^{--}$ (44)**

$H_2O + H_2CrO_4 + Th(CrO_4)_2$; *v.* Fig. 168

| | Solid phases | Liquid phase, 25°C | |
|---|---|---|---|
| | | % $CrO_3$ | % $ThO_2$ |
| A | $CrO_3$ | 62.87 | |
| B | $ThO_2.3CrO_3.3H_2O$ | 52.60 | 7.91 |
| C | $ThO_2.3CrO_3.3H_2O + ThO_2.2CrO_3.3H_2O$ | 39.49 | 24.22 |
| | $ThO_2.2CrO_3.3H_2O$ | 0.033 | 0.044 |

**$Hg^{++}$ $CrO_4^{--}$ (89, 90): $H_2O + HgO + H_2CrO_4$**

| $t$ = 25°C | | $t$ = 50°C | | $t$ = 25°C | | $t$ = 50°C | |
|---|---|---|---|---|---|---|---|
| $M_{CrO_3}$/l | $M_{HgO}$/l | $M_{CrO_3}$/l | $M_{HgO}$/l | $M_{CrO_3}$/l | $M_{HgO}$/l | $M_{CrO_3}$/l | $M_{HgO}$/l |
| $CrO_3 + HgCr_2O_7$ | | | | $HgCrO_4 + 3HgO.CrO_3$ | | | |
| 11.40* | | | | | | 0.712* | 0.0745* |
| $HgCr_2O_7 + HgCrO_4$ | | | | $3HgO.CrO_3$ | | | |
| 10.40 | 0.7585 | | | | | 0.64 | 0.0605 |
| $HgCrO_4$ | | | | | | 0.475 | 0.035 |
| 9.90 | | 1.006 | 0.1 | | | 0.371 | 0.0225 |
| 6.73 | | 0.907 | 0.092 | | | 0.254 | 0.012 |
| 4.16 | | 0.740 | 0.072 | | | 0.154 | 0.0036 |
| 2.08 | | 0.683 | 0.071m | | | 0.00137 | |
| 1.035 | | 0.583 | 0.061m | $3HgO.CrO_3$ | | | |
| | | 0.522 | 0.050m | | | 0.00012 | |
| | | 0.499 | 0.049m | | | | |

* Mean of several determinations.

**$Pt(CN)_4^{--}$ $Li^+$ $K^+$ (379)**

$H_2O + Li_2Pt(CN)_4 + K_2Pt(CN)_4$; *v.* Fig. 169

| | Solid phases | Liquid phase, 24.1°C | |
|---|---|---|---|
| | | % $K_2Pt(CN)_4$ | % $Li_2Pt(CN)_4$ |
| A | $K_2Pt(CN)_4.3H_2O$ | 28.60 | |
| B | | 23.60 | 10.20 |
| C | | 16.10 | 27.30 |
| D | | 18.65 | 29.30 |
| E | $LiKPt(CN)_4.2H_2O$ | 13.90 | 30.50 |
| | $Li_2Pt(CN)_4.5H_2O$ | | 59.20 |

**$MnO_4^-$ $K^+$ (319)**

$H_2O + KOH + KMnO_4$; *v. also* p. 379

| °C | M KOH/l | M $KMnO_4$/l | M KOH/l | M $KMnO_4$/l | M KOH/l | M $KMnO_4$/l | M KOH/l | M $KMnO_4$/l |
|---|---|---|---|---|---|---|---|---|
| | $KMnO_4$ | | | | | | | |
| 0 | 0 | 0.176 | 1 | 0.050 | 2 | 0.031 | 4 | 0.027 |
| 10 | 0 | 0.278 | 1 | 0.112 | 2 | 0.068 | 4 | 0.048 |
| 20 | 0 | 0.411 | 1 | 0.179 | 2 | 0.119 | 4 | 0.079 |
| 30 | 0 | 0.573 | | | | | | |
| 32 | | | 1 | 0.316 | 2 | 0.213 | 4 | 0.149 |
| 40 | 0 | 0.792 | 1 | 0.439 | 2 | 0.306 | 4 | 0.211 |
| 50 | | | 1 | 0.638 | 2 | 0.462 | 4 | 0.304 |
| 53 | 0 | 1.154 | | | | | | |
| 60 | | | | | 2 | 0.639 | | |
| 61 | | | 1 | 0.904 | | | | |
| 63 | 0 | 1.429 | | | | | | |
| 70 | 0 | 1.812 | 1 | 1.172 | 2 | 0.869 | 4 | 0.572 |
| 75 | 0 | 2.047 | | | | | 4 | 0.651 |
| 80 | | | 1 | 1.513 | 2 | 1.190 | | |
| 83 | | | | | | | 4 | 0.803 |
| 84 | | | 1 | 1.655 | 2 | 1.352 | | |

**$MnO_4^-$ $K^+$ $Rb^+$**

$H_2O + KMnO_4 + RbMnO_4$

$t$ = 6.8–7.2°C (277)

| Solid phases | Wt. % $RbMnO_4$ | Liquid phase | |
|---|---|---|---|
| | | % $KMnO_4$ | % $RbMnO_4$ |
| $KMnO_4$ | | | 0.60 |
| Solid soln. I | 2.728 | 0.425 | 0.461 |
| | 4.625 | 0.787 | 0.397 |
| Solid solns. I + II | 10.979 | 1.237 | 0.368 |
| | 20.790 | 1.502 | 0.460 |
| | 28.767 | 1.870 | 0.629 |
| | 64.574 | 2.568 | 0.818 |
| | 90.514 | 3.057 | 0.822 |
| | 99.264 | 3.154 | 0.902 |
| Solid soln. II | 99.178 | 3.195 | 0.825 |
| | 99.152 | 3.468 | 0.517 |
| $RbMnO_4$ | 100.00 | 4.071 | 0 |

**$Fe(CN)_6^{----}$ $Ca^{++}$ $Na^+$ (405)**

$H_2O + Ca_2Fe(CN)_6 + Na_4Fe(CN)_6$

**$Fe(CN)_6^{----}$ $Na^+$ $K^+$**

$H_2O + Na_4Fe(CN)_6 + K_4Fe(CN)_6$

$t$ = 25°C (164)

g per 1000g $H_2O$

| $K_4Fe(CN)_6$ | $Na_4Fe(CN)_6$ |
|---|---|
| $K_4Fe(CN)_6.3H_2O$ | |
| 0.8946 | 0.0 |
| 0.88272 | 0.05072 |
| 0.88544 | 0.06633 |
| 0.88088 | 0.12306 |
| 0.89116 | 0.25972 |
| 0.91600 | 0.4900 |
| 0.99000 | 0.87034 |
| 1.01200 | 0.91060 |
| 1.05177 | 0.95879 |
| 1.11590 | 1.04380 |
| $Na_4Fe(CN)_6.12H_2O$ | |
| 1.0578 | 0.9588 |
| 0.6994 | 0.8984 |
| 0.6111 | 0.8712 |
| 0.5850 | 0.8652 |
| 0.3532 | 0.7814 |
| 0.2722 | 0.7610 |
| 0.2115 | 0.7253 |
| 0.1789 | 0.7213 |
| 0.1624 | 0.7117 |
| 0.1327 | 0.7056 |
| 0.000 | 0.6818 |

**$CrO_3^{---}$ $Na^+$**

$H_2O + H_3CrO_3 + NaOH$

$t$ = 18°C (275)

| $M_{NaOH}$/l | $M_{Cr}$/l |
|---|---|
| $Cr(OH)_3$* | |
| 4.9 | 0.016 |
| 8.1 | 0.052 |
| 9.5 | 0.076 |
| 11.8 | 0.080 |
| 14.6 | 0.143 |
| 17.6 | 0.015 |

**$CrO_3^{---}$ $Na^+$.—(*Continued*)**

| $M_{NaOH}$/l | $M_{Cr}$/l |
|---|---|
| $Cr_2O_3$ | |
| 7.5 | Tr. |
| 9.0 | 0.0038 |
| 11.2 | 0.0081 |
| 14.5 | 0.0205 |
| 15.8 | 0.0039 |
| 16.8 | 0.0015 |
| 18.0 | Tr. |
| $Na_3CrO_3$(?) | |
| 16.5 | 0.004 |
| 15.5 | 0.006 |
| 14.5 | 0.010 |
| 14.0 | 0.0134 |
| 13.2 | 0.0165 |
| 11.2 | 0.038 |
| 15.5 | 0.057 |

* Author states that the polymerization changes in the solid phase play an important part in the equilibrium here concerned.

**$CrO_4^{--}$ $BO_3^{---}$ (145)**

$H_2O + H_2CrO_4 + H_3BO_3$

$t$ = 25°C

| % $B_2O_3$ | % $CrO_3$ |
|---|---|
| $H_3BO_3$ | |
| 0.10 | 62.40 |
| 0.16 | 59.90 |
| 0.42 | 49.75 |
| 0.92 | 37.89 |
| 1.35 | 24.31 |
| 2.28 | 9.42 |
| 2.79 | 4.90 |
| $t$ = 45°C | |
| $H_3BO_3$ | |
| 0.9 | 61.56 |
| 0.92 | 58.10 |
| 0.87 | 57.50 |
| 1.12 | 57.34 |
| 0.85 | 53.80 |
| 2.33 | 25.60 |
| 4.76 | 24.0 |

### $MnO_4^{--}$ $K^+$ (319)

$H_2O + KOH + K_2MnO_4$

| °C | M KOH/l | M $K_2MnO_4$/l | M KOH/l | M $K_2MnO_4$/l | M KOH/l | M $K_2MnO_4$/l | M KOH/l | M $K_2MnO_4$/l | M KOH/l | M $K_2MnO_4$/l |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $K_2MnO_4$ | | | | |
| 0 | 2 | 0.907 | 4 | 0.554 | 6 | 0.155 | 8 | 0.063 | 10 | 0.0145 |
| 10 | 2 | 1.013 | | | | | 8 | 0.070 | 10 | 0.0152 |
| 15 | | | | | 6 | 0.224 | | | | |
| 17 | | | 4 | 0.681 | | | | | | |
| 20 | 2 | 1.140 | | | | | 8 | 0.078 | 10 | 0.016 |
| 23 | | | | | 6 | 0.261 | | | | |
| 25 | | | 4 | 0.733 | | | | | | |
| 30 | 2 | 1.252 | 4 | 0.772 | 6 | 0.303 | 8 | 0.096 | 10 | 0.0215 |
| 40 | | | 4 | 0.852 | 6 | 0.362 | 8 | 0.119 | 10 | 0.0305 |
| 45 | 2 | 1.424 | 4 | 0.889 | 6 | 0.388 | | | | |
| 50 | | | | | | | 8 | 0.142 | 10 | 0.0462 |
| 51 | | | 4 | 0.938 | | | | | | |
| 60 | | | 4 | 1.003 | 6 | 0.469 | 8 | 0.167 | | |
| 63 | | | | | | | | | 10 | 0.062 |
| 70 | | | 4 | 1.074 | 6 | 0.528 | 8 | 0.196 | 10 | 0.070 |
| 80 | | | 4 | 1.143 | 6 | 0.587 | 8 | 0.222 | 10 | 0.083 |

### $CrO_4^{--}$ $MoO_4^{--}$ $K^+$

$H_2O + K_2CrO_4 + K_2MoO_4$

$t$ = 25°C (2)

| Solid phases | % $K_2MoO_4$ | Liquid phase—g per 100g $H_2O$ | |
|---|---|---|---|
| | | $K_2CrO_4$ | $K_2MoO_4$ |
| $K_2CrO_4$ | | 64.62 | 0.0 |
| Solid soln | 0.35 | 49.59 | 15.37 |
| | 0.57 | 38.90 | 38.79 |
| | 0.94 | 33.21 | 50.96 |
| | 1.25 | 14.13 | 98.72 |
| | 2.58 | 10.07 | 118.80 |
| | 2.98 | 10.24 | 119.90 |
| | 5.32 | 7.12 | 137.8 |
| | 6.74 | 6.32 | 157.2 |
| | 10.34 | 4.92 | 165.4 |
| | 26.80 | 2.14 | 180.8 |
| | 36.21 | 1.70 | 183.0 |
| $K_2MoO_4$ | | 0.0 | 184.6 |

### $CrO_4^{--}$ $Li^+$ (336)

$H_2O + H_2CrO_4 + LiOH$; *v.* Fig. 170

| | Solid phases | Liquid phase, 30°C | |
|---|---|---|---|
| | | % $CrO_3$ | % $Li_2O$ |
| A | $Li(OH).H_2O$ | | 7.09 |
| B | $Li(OH).H_2O + Li_2O.CrO_3.2H_2O$ | 37.50 | 14.34 |
| C | $Li_2O.CrO_3.2H_2O$ | 38.55 | 11.44 |
| D | $Li_2O.CrO_3.2H_2O + Li_2O.2CrO_3.2H_2O$ | 43.40 | 11.81 |
| E | $Li_2O.2CrO_3.2H_2O$ | 47.95 | 7.95 |
| F | $Li_2O.2CrO_3.2H_2O + CrO_3$ | 67.73 | 5.69 |
| H | $CrO_3$ | 63.99 | 3.51 |
| | | 62.28 | 0 |

### $CrO_4^{--}$ $Na^+$ (336)

$H_2O + H_2CrO_4 + NaOH$; *v.* Fig. 171

| | Solid phases | Liquid phase, 30°C | |
|---|---|---|---|
| | | % $CrO_3$ | % $Na_2O$ |
| A | $NaOH.H_2O$ | | 42.0 *ca.* |
| B | $NaOH.H_2O + Na_2O.CrO_3$ | 2.0 | 41.44 |

### $CrO_4^{--}$ $Na^+$.—(*Continued*)

| | Solid phases | Liquid phase, 30°C | |
|---|---|---|---|
| | | % $CrO_3$ | % $Na_2O$ |
| C | $Na_2O.CrO_3 + 2Na_2O.CrO_3.13H_2O$ | 10.22 | 29.39 |
| | $2Na_2O.CrO_3.13H_2O$ | 13.12 | 23.91 |
| E | $2Na_2O.CrO_3.13H_2O + Na_2O.CrO_3.4H_2O$ | 19.26 | 22.98 |
| F | $Na_2O.CrO_3.4H_2O$ | 28.82 | 17.88 |
| G | $Na_2O.CrO_3.4H_2O + Na_2O.2CrO_3.2H_2O$ | 48.70 | 16.49 |
| H | $Na_2O.2CrO_3.2H_2O + Na_2O.3CrO_3.H_2O$ | 66.13 | 13.70 |
| I | $Na_2O.3CrO_3.H_2O + Na_2O.4CrO_3.4H_2O$ | 68.46 | 10.95 |
| J | $Na_2O.4CrO_3.4H_2O + CrO_3$ | | |
| K | $CrO_3$ | 62.28 | |

### $CrO_4^{--}$ $K^+$; *v.* p. 380

### $BO_3^{---}$ $Ca^{++}$: $H_2O + H_3BO_3 + Ca(OH)_2$

$t$ = 30°C (324)

| % CaO | % $B_2O_3$ | % CaO | % $B_2O_3$ |
|---|---|---|---|
| $CaO.H_2O$ | | $CaO.3B_2O_3.9H_2O + CaO.-3B_2O_3.12H_2O$ | |
| 0.1263 | 0.0140 | | |
| 0.1398 | 0.0321 | 0.0936* | 1.359* |
| $aO.H_2O + CaO.B_2O_3.6H_2O$ | | $CaO.3B_2O_3.12H_2O$ | |
| 0.2113* | 0.1291* | 0.1436 | 1.64 |
| $CaO.B_2O_3.6H_2O$ | | 0.0928 | 2.0588 |
| 0.22 | 0.1335 | 0.2153 | 2.178 |
| 0.1177 | 0.1379 | 0.2743 | 2.471 |
| 0.1085 | 0.1395 | 0.2232 | 2.434 |
| 0.110 | 0.140 | 0.0991 | 2.509 |
| $CaO.B_2O_3.6H_2O + CaO.-3B_2O_3.9H_2O$ | | 0.1095 | 2.55 |
| | | 0.2633 | 2.6055 |
| 0.1100* | 0.1688* | 0.1085 | 2.798 |
| $CaO.3B_2O_3.9H_2O$ | | 0.1304 | 3.128 |
| 0.0516 | 0.2897 | 0.1433 | 3.3133 |
| 0.0555 | 0.3306 | 0.3719 | 3.643 |
| 0.0471 | 0.6117 | 0.152 | 3.841 |
| 0.0595 | 0.7669 | $CaO.3B_2O_3.12H_2O + H_3BO_3$ | |
| 0.0666 | 0.8691 | 0.155 | 4.250 |
| 0.0772 | 1.025 | $H_3BO_3$ | |
| 0.0759 | 1.116 | 0.1368 | 4.1793 |

* Average of several determinations.

### $CrO_4^{--}$ $K^+$ (234): $H_2O + H_2CrO_4 + KOH$; *v.* Fig. 172

| | Solid phases | Liquid phase | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $t$ = 0°C | | $t$ = 20°C | | $t$ = 30°C* | | $t$ = 60°C | |
| | | % $K_2O$ | % $CrO_3$ | % $K_2O$ | % $CrO_3$ | % $K_2O$ | % $CrO_3$ | % $K_2O$ | % $CrO_3$ |
| A | $KOH.2H_2O$ | 31.18 | | | | 46.80 | | 50 *ca.* | |
| B | $K_2O.CrO_3$ | 26.06 | 0.54 | | | 26.89 | 0.94 | 32.98 | 0.53 |
| | | 17.73 | 5.50 | | | 19.52 | 6.99 | 21.05 | 9.15 |
| D | $K_2O.CrO_3 + K_2O.2CrO_3$ | 17.73 | 19.10 | | | 19.35 | 21.00 | 20.62 | 23.61 |
| E | $K_2O.2CrO_3$ | 1.41 | 3.00 | | | 4.98 | 10.48 | 10.01 | 21.24 |
| F | $K_2O.2CrO_3 + K_2O.3CrO_3$ | 1.47 | 42.00 | 2.20 | 43.10 | 2.50 | 44.50 | 7.06 | 49.84 |
| G | $K_2O.3CrO_3 + K_2O.4CrO_3$ | 1.37 | 47.40 | 2.00 | 48.46 | 2.25 | 49.95 | 5.01 | 54.09 |
| H | $K_2O.4CrO_3 + CrO_3$ | 0.64 | 61.80 | 0.62 | 62.80 | 0.69 | 62.81 | 1.27 | 65.77 |
| I | $CrO_3$ | | 61.54 | | 61.80 | | 62.52 | | 65.12 |

* In good agreement with work of Schreinemakers (336).

### $CrO_4^{--}$ $K^+$.—(*Continued*)

| °C | % $K_2O$ | % $CrO_3$ | °C | % $K_2O$ | % $CrO_3$ |
|---|---|---|---|---|---|
| $H_2O + K_2CrO_4$ | | | $H_2O + K_2Cr_2O_7$ | | |
| −25 | 20.0 | 5.70 | −22.10 | | 35.94 |
| −13 | 17.52 | 13.89 | −26.77 | 0.88 | 39.86 |
| $H_2O + K_2CrO_4 + K_2Cr_2O_7$ | | | $H_2O + K_2Cr_2O_7 + K_2Cr_3O_{10}$ | | |
| −11.50 | 17.18 | 18.11 | −30.19 | 1.18 | 42.42 |
| $H_2O + K_2Cr_2O_7$ | | | $H_2O + K_2Cr_3O_{10}$ | | |
| − 5 | 8.27 | 8.01 | −34.01 | 0.95 | 43.45 |
| − 0.63 | 1.38 | 2.93 | $H_2O + K_2Cr_3O_{10} + K_2Cr_4O_{13}$ | | |
| − 6.43 | 0.48 | 17.25 | −39 | 0.79 | 45.69 |
| −10.25 | 0.45 | 23.63 | $H_2O + K_2Cr_4O_{13}$ | | |
| −13.25 | | 27.07 | −49 | | 49.11 |
| | | | −61.5 | 0.61 | 53.57 |

### $BO_3^{---}$ $Li^+$ (112)

$H_2O + H_3BO_3 + LiOH$; *v.* Fig. 173

| | Solid phases | Liquid phase, 30°C | |
|---|---|---|---|
| | | % $Li_2O$ | % $B_2O_3$ |
| A | $B(OH)_3$ | | 3.54 |
| B | $B(OH)_3 + Li_2O.5B_2O_3.10H_2O$ | 1.30 | 14.14 |
| C | $Li_2O.5B_2O_3.10H_2O + Li_2O.2B_2O_3.xH_2O$* | 5.06 | 30.81 |
| D | $Li_2O.2B_2O_3$ | 0.53 | 2.47 |
| E | | 0.95 | 2.61 |
| F | $Li_2O.2B_2O_3.xH_2O + Li_2O.B_2O_3.16H_2O$* | 5.63 | 23.84 |
| G | $Li_2O.B_2O_3.16H_2O$ | 1.58 | 3.27 |
| H | | 2.94 | 2.51 |
| I | $Li_2O.B_2O_3.16H_2O + LiOH.H_2O$ | 7.71 | 3.38 |
| J | $LiOH.H_2O$ | 7.01 | |

* Evidence for saturation with this solid from graphical interpolation.

### $BO_3^{---}$ $Na^+$ (111)

$H_2O + H_3BO_3 + NaOH$; *v.* Fig. 174

| | Solid phases | Liquid phase, 30°C | |
|---|---|---|---|
| | | % $Na_2O$ | % $B_2O_3$ |
| A | $B(OH)_3$ | | 3.54 |
| B | $B(OH)_3 + Na_2O.5B_2O_3.10H_2O$ | 1.99 | 11.84 |
| C | $Na_2O.5B_2O_3.10H_2O + Na_2O.2B_2O_3.10H_2O$ | 4.08 | 17.20 |
| D | $Na_2O.2B_2O_3.10H_2O$ | 1.88 | 2.41 |
| E* | $Na_2O.2B_2O_3.10H_2O + Na_2O.B_2O_3.8H_2O$ | 10.40 | 12.80 |
| F | $Na_2O.B_2O_3.8H_2O$ | 13.25 | 8.18 |
| G | | 18.31 | 4.97 |
| H | $Na_2O.B_2O_3.8H_2O + Na_2O.B_2O_3.4H_4O$ | 21.58 | 4.63 |
| I | $Na_2O.B_2O_3.4H_2O$ | 29.39 | 2.51 |
| J* | $Na_2O.B_2O_3.4H_2O + NaOH.H_2O$ | 41.30 | 7.80 |

* By interpolation.

### $BO_3^{---}$ $K^+$ (111)

$H_2O + H_3BO_3 + KOH$; *v.* Fig. 175

| | Solid phases | Liquid phase, 30°C | |
|---|---|---|---|
| | | % $K_2O$ | % $B_2O_3$ |
| A | $B(OH)_3$ | | 3.54 |
| B | $B(OH)_3 + K_2O.5B_2O_3.8H_2O$ | 0.33 | 4.58 |
| C | $K_2O.5B_2O_3.8H_2O$ | 0.80 | 3.05 |
| D | $K_2O.5B_2O_3.8H_2O + K_2O.2B_2O_3.4H_2O$ | 7.73 | 13.37 |
| E | $K_2O.2B_2O_3.4H_2O$ | 6.22 | 9.13 |
| F | | 9.18 | 8.0 |
| G* | $K_2O.2B_2O_3.4H_2O + K_2O.B_2O_3.\frac{5}{2}H_2O$ | 25.0 | 19.8 |
| H | $K_2O.B_2O_3.\frac{5}{2}H_2O$ | 26.89 | 12.12 |
| I | | 32.74 | 3.51 |
| J | $K_2O.B_2O_3.\frac{5}{2}H_2O + KOH.2H_2O$ | 46.45 | 0.72 |
| K | $KOH.2H_2O$ | 47.50 | |

* By interpolation.

### $AlO_2^-$ $Ba^{++}$

$H_2O + Al_2O_3 + BaO$

$t$ = 20°C (253)

| % BaO | % $Al_2O_3$ |
|---|---|
| $Ba(OH)_2.8H_2O$ | |
| 3.32 | 0.0 |
| 3.39 | 0.002 |
| 3.45 | 0.430 |
| $Ba(OH)_2.8H_2O + Al_2O_3$ | |
| 3.50 | 0.680 |
| $2BaO.Al_2O_3.5H_2O$ | |
| 3.51 | 0.673 |
| 3.541 | 0.659 |
| 3.523 | 0.661 |
| 2.211 | 0.641 |
| $2BaO.Al_2O_3.5H_2O + Al_2O_3$ | |
| 2.131 | 0.628 |
| $BaO.6H_2O$ | |
| 2.091 | 0.618 |
| 2.154 | 0.637 |
| 2.117 | 0.625 |
| $Al_2O_3.BaO.6H_2O$ | |
| 1.873 | 0.456 |
| 1.732 | 0.378 |
| 1.654 | 0.345 |
| 1.330 | 0.279 |
| $Al_2O_3.BaO.6H_2O + Al_2O_3.xH_2O$ | |
| 1.205* | 0.210* |
| $Al_2O_3.xH_2O$ | |
| 0.902 | 0.118 |

### $AlO_2^-$ $Ba^{++}$.—(*Continued*)

| % BaO | % $Al_2O_3$ |
|---|---|
| $Al_2O_3.xH_2O$ | |
| 0.519 | 0.037 |
| 0.01 | 0.002 |

* Mean of several results.

### $AlO_2^-$ $Na^+$; *v.* p. 381

### $Be^{++}$ (= $Gl^{++}$)$Na^+$

$H_2O + Be(OH)_2 + NaOH$

$t$ = 25°C (401)

| $M_{Be}$/l | $M_{Na}$/l |
|---|---|
| $Be(OH)_2$ | |
| 0.033 | 0.268 |
| 0.0492 | 0.318 |
| 0.0841 | 0.446 |
| 0.089 | 0.526 |
| 0.101 | 0.563 |
| 0.143 | 0.801 |
| 0.203 | 0.854 |

### $Ba^{++}$ $Na^+$

$H_2O + BaO + Na_2O$

$t$ = 30°C (339)

| % BaO | % $Na_2O$ |
|---|---|
| $BaO.9H_2O$ | |
| 4.99 | 0 |
| 1.29 | 4.78 |
| 0.89 | 6.43 |
| 0.57 | 9.63 |
| 0.53 | 11.62 |
| 0.47 | 17.87 |
| 1.06 | 23.28 |

**$Ba^{++}$ $Na^{+}$.—(*Continued*)**

| % BaO | % $Na_2O$ |
|---|---|
| $BaO.9H_2O$ + $BaO.4H_2O$ | |
| 1.87 | 24.63 |
| $BaO.4H_2O$ | |
| 1.84 | 26.14 |
| 1.75 | 27.72 |
| 1.58 | 28.43 |
| $BaO.4H_2O$ + $BaO.2H_2O$ | |
| 1.34 | 29.24 |
| $BaO.2H_2O$ | |
| 0.82 | 32.12 |
| 0.59 | 34.72 |
| $BaO.2H_2O$ + $NaOH.H_2O$ | |
| 0.57 | 41.09 |
| $NaOH.H_2O$ | |
| 0 | 42.00 |

$AlO_2^-$ $Na^+$ (152)

$H_2O + H_3AlO_3 + NaOH$; *v.* Fig. 176

| | Solid phases | Liquid phase, 30°C: % $Al_2O_3$ | % $Na_2O$ |
|---|---|---|---|
| A | | 0.08 | 5.5 |
| | $Al_2O_3.3H_2O$* | 0.5 | 9.4 |
| B | | 3.2 | 21.7 |
| C | $Al_2O_3.3H_2O + 3Al_2O_3.4Na_2O.16H_2O$ | 4.9 | 24.6 |
| D | | 2.1 | 26.5 |
| | $3Al_2O_3.4Na_2O.16H_2O$ | 2.5 | 30.2 |
| | | 4.3 | 32.5 |
| E | $3Al_2O_3.4Na_2O.16H_2O + Al_2O_3.4Na_2O.10H_2O$ | 5.2 | 34.3 |
| | $Al_2O_3.4Na_2O.10H_2O$ | 1.9 | 37.3 |
| F | $Al_2O_3.4Na_2O.10H_2O + Na_2O.3H_2O$ | 0.1 | 40.8 |
| | $Na_2O.3H_2O$ | 0 | 41.9 |
| | | 3.07 | 6.12 |
| | $Al_2O_3(3H_2O)$† | 8.50 | 15.70 |
| | $Al_2O_3.3H_2O$‡ | 0.4 | 4.9 |

* Crystalline form. † Metastable form I. ‡ Metastable form II.

## LITERATURE

(For a key to the periodicals see end of volume)


(1) d'Agostino, *73*, **2**: 171; 10. (2) Amadori, *22*, **21 I**: 667; 11. (3) Amadori and Pampanini, *22*, **20 II**: 473; 11. (4) Anderson, *45*, **11**: 327; 19. (5) Anderson and Nestell, *45*, **12**: 243; 20. (6) Ando, *429*, **8**: 283; 25. (6.5) Antropoff and Sommer, *7*, **123**: 161; 26. (7) Applebey and Lane, *4*, **113**: 609; 18. (8) Applebey and Reid, *4*, **121**: 2129; 22. (9) Applebey and Wilkes, *4*, **121**: 337; 22.

(10) Araki, *429*, **8A**: 213; 25. (11) Archibald and Gale, *1*, **46**: 1760; 24. (12) Archibald and Habasian, *69*, **11 III**: 1; 17. (13) Archibald and Kern, *69*, **11 III**: 7; 17. (14) Armstrong and Eyre, *5*, **84**: 123; 10. (15) de Baat, *Diss.*, Leiden, 1923. (16) Bakhuis Roozeboom, *7*, **8**: 531; 91. (17) Bakhuis Roozeboom and Schreinemakers, *7*, **15**: 588; 94. (18) Banthisch, *52*, **29**: 54; 84. (19) Barbaudy, *70*, **42**: 638; 23.

(20) Barre, *34*, **150**: 1321; 10. (21) Barre, *34*, **150**: 1599; 10. (22) Barre, *34*, **151**: 871; 10. (23) Barre, *27*, **11**: 646; 12. (24) Bassett, *93*, **59**: 1; 08. (25) Bassett and Corbet, *4*, **125**: 1660; 24. (26) Bassett and Halton, *4*, **123**: 1291; 23. (27) Bassett and Taylor, *4*, **105**: 1926; 14. (27.5) Baur, *9*, **32**: 428; 26. (28) Bell and Taber, *50*, **10**: 119; 06. (29) Bell and Taber, *50*, **11**: 492; 07.

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(50) Bruner, *7*, **26**: 145; 98. (51) Bugarszky, *7*, **11**: 668; 93. **12**: 223; 93. (51.1) Burrage, *4*, **1926**: 1703. (51.5) Burrage, *4*, **1926**: 1896. (52) Caillart, *191*, **41**: 21; 18. (53) Cameron, *492*, No. **18**: 01. (54) Cameron, *50*, **5**: 556; 01. (55) Cameron and Bell, *50*, **10**: 210; 06. (56) Cameron and Bell, *492*, No. **33**: 06. (57) Cameron and Bell, *492*, No. **41**: 07. (58) Cameron and Bell, *50*, **11**: 363; 07. (59) Cameron, Bell and Robinson, *50*, **11**: 396; 07.

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(70) Carter and Hartshorne, *4*, **123**: 2223; 23. (71) Carter and Hartshorne, *4*, **1926**: 363. (72) Caspari, *4*, **125**: 2381; 24. (72.5) Caven and Johnston, *4*, **1926**: 2628. (73) Caven and Mitchell, *4*, **125**: 1428; 24. (74) Clark, *1*, **41**: 1477; 19. (75) Clendinnen, *4*, **121**: 801; 22. (76) Clendinnen, *4*, **123**: 1338; 23. (77) Clendinnen and Rivett, *4*, **119**: 1329; 21. (78) Clendinnen and Rivett, *4*, **123**: 1244; 23. (79) Cocheret, *Diss.*, Rotterdam, 1911.

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(90) Cox, *93*, **50**: 226; 06. (91) Creighton and Ward, *1*, **37**: 2333; 15. (92) van Dam and Donk, *176*, **8**: 846; 11. (93) D'Ans, *93*, **61**: 91; 09. (94) D'Ans, *93*, **62**: 129; 09. (95) D'Ans, *93*, **65**: 231; 10. (96) D'Ans, *93*, **80**: 235; 13. (97) D'Ans, *493*, **9**: 148, 161, 177, 193, 217, 229; 15. (98) D'Ans and Schreiner, *93*, **67**: 437; 10. (99) D'Ans and Schreiner, *7*, **75**: 95; 10.

(100) Dawkins, *4*, **121**: 776; 22. (101) Dawson, *4*, **113**: 675; 18. (102) Demassieux, *34*, **158**: 183, 702; 14. (103) Demassieux, *34*, **177**: 51; 23. (104) Ditte, *34*, **126**: 694; 98. (105) Dolber, *Diss.*, Erlangen, 1913. (106) Donnan and Thomas, *4*, **99**: 1788; 11. (107) van Dorp, *7*, **73**: 284, 289; 10. (109) Driot, *34*, **150**: 1426; 10.

(110) Drucker, *93*, **28**: 361; 01. (111) Dukelski, *93*, **50**: 38; 06. (112) Dukelski, *93*, **54**: 45; 07. (113) Dukelski, *93*, **62**: 114, 118; 09. (114) Dunningham, *4*, **101**: 431; 12. (115) Dutilh, *87*, **11**: No. 4; 12. (116) Eberly, Gross and Crowell, *1*, **42**: 1433; 20. (116.5) Elliott, Kleist, Wilkins and Webb, *4*, **1926**: 1219. (117) von Ende, *93*, **26**: 129; 01. (118) Engel, *34*, **104**: 911; 87. *27*, **47**: 677; 87. (119) Engel, *6*, **17**: 338; 89.

(120) Euler, *7*, **49**: 301; 04. (121) Fairhall, *1*, **46**: 1593; 24. (122) Fedotiev, *7*, **49**: 162; 04. (123) Fedotiev, *93*, **73**: 173; 11. (124) Fedotiev and Kolossov, *93*, **130**: 39; 23. (125) Fedotiev and Koltunov, *93*, **85**: 247; 14. (126) Findlay and Cruickshank, *4*, **1926**: 316. (127) Findlay, Morgan and Morris, *4*, **105**: 779; 14. (128) Fock, *7*, **12**: 657; 93. (129) Fock, *94*, **28**: 337; 97.

(130) Foote, *11*, **26**: 418; 01. (131) Foote, *7*, **46**: 79; 03. (132) Foote, *1*, **33**: 463; 11. (133) Foote, *1*, **34**: 880; 12. (134) Foote, *1*, **37**: 288; 15. (135) Foote, *45*, **11**: 629; 19. (136) Foote, *1*, **45**: 663; 23. (137) Foote and Bristol, *11*, **32**: 246; 04. (138) Foote and Saxton, *4*, **36**: 1695; 14. (139) Foote and Smith, *1*, **46**: 84; 24.

(140) Fox, *4*, **95**: 878; 09. (141) Freeth, *62*, **223**: 35; 22. (142) Freeth, *Diss.*, Leiden, 1924. (143) Fujimura, *429*, **1**: 63; 14. (144) Garran, *4*, **1926**: 848. (145) Gilbert, *4*, **127**: 1541; 25. (146) Gilbert, Buckley and Masson, *4*, **121**: 1934; 22. (147) Glasstone, *4*, **121**: 58; 22. (148) Glasstone and Riggs, *4*, **127**: 2846; 25. (149) Glasstone and Saunders, *4*, **123**: 2134; 23.

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(160) Hammick, Goadby and Booth, *4*, **117**: 1589; 20. (161) Harkins and Paine, *1*, **38**: 2709; 16. (162) Harkins and Paine, *1*, **41**: 1155; 19. (163) Harkins and Pearce, *1*, **38**: 2679; 16. (164) Harkins and Pearce, *1*, **38**: 2714; 16. (165) Hartley, Drugman, Vlieland and Bourdillon, *4*, **103**: 1747; 13. (166) Hauser, *93*, **45**: 185; 05. (167) Hauser, *93*, **54**: 196; 07. (168) Hauser and Wirth, *93*, **78**: 75; 12. (169) Hayami, *429*, **4**: 359; 21.

(170) van der Heide, *7*, **12**: 416; 93. (171) Hempel and Tedesco, *92*, **24**: 2459; 11. (172) Henderson and Taylor, *50*, **20**: 663; 16. (173) Hendricks, *50*, **30**: 248; 26. (174) Herold, *9*, **11**: 417; 05. (175) Herz, *93*, **33**: 353; 03. (176) Herz, *93*, **67**: 365; 10. (177) Herz, *93*, **68**: 69; 10. (178) Herz, *93*, **68**: 165; 10. (179) Herz, *93*, **73**: 274; 11.

(180) Herz and Bulla, *93*, **61**: 387; 09. (181) Herz and Hellebrandt, *93*, **130**: 188; 23. (182) Herz and Paul, *93*, **82**: 431; 13. (183) Hicks, *1*, **37**: 844; 15. (184) Hill, *1*, **39**: 218; 17. (184.5) Hill and Miller, *1*, **49**: 669; 27. (185) Hill and Simmons, *1*, **31**: 821; 09. (186) Hinrichsen and Sachsel, *7*, **50**: 81; 04. (187) van't Hoff, *93*, **47**: 244; 05. (188) van't Hoff, *76*, **1905**: 478. (189) van't Hoff, *Zur Bildung der ozeanischen Salzablagerungen*, 1; 35. Braunschweig, Vieweg u. Sohn, 1905.

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(200) van't Hoff and Meyerhoffer, *76*, **1897**: 1019. (201) van't Hoff and Meyerhoffer, *76*, **1898**: 590. (202) van't Hoff and Meyerhoffer, *7*, **30**: 64; 99. (203) van't Hoff, Meyerhoffer and Cottrell, *76*, **1902**: 276. (204) van't Hoff, Sachs and Biach, *76*, **1904**: 576. (205) van't Hoff, Voerman and Blasdale, *76*, **1905**: 305. (206) van't Hoff and Williams, *76*, **1898**: 808. (207) van't Hoff and Wilson, *76*, **1900**: 1142. (208) Hoffman, Ehrhardt and Schreiner, *25*, **46**: 1657; 13. (209) Hogg, *4*, **1926**: 855.

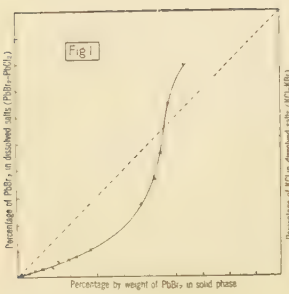


Fig 1
Percentage of PbBr₂ in dissolved salts (PbBr₂+PbCl₂)
Percentage by weight of PbBr₂ in solid phase

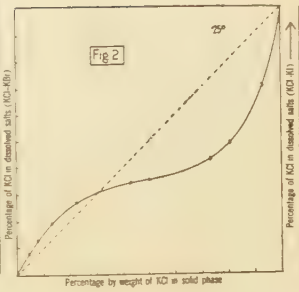


Fig 2
25°
Percentage of KCl in dissolved salts (KCl+KBr)
Percentage by weight of KCl in solid phase

Fig 3
25°
Percentage of KCl in dissolved salts (KCl :KI)
Percentage by weight of KCl in solid phase

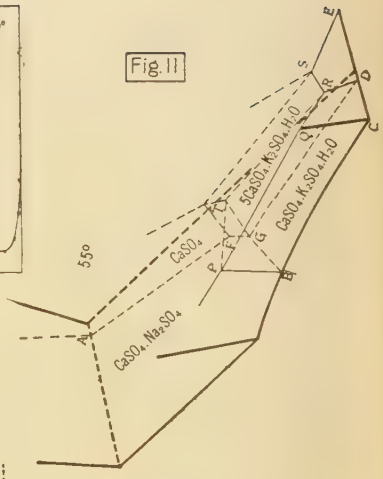


Fig. 11
55°
CaSO₄
5CaSO₄.K₂SO₄.H₂O
CaSO₄.K₂SO₄.H₂O
CaSO₄.Na₂SO₄

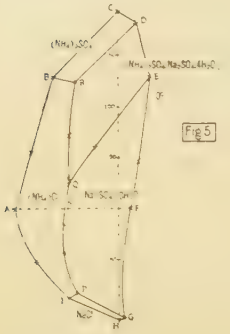


Fig 5
(NH₄)₂SO₄
NH₄Cl

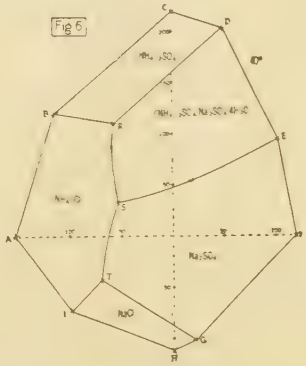


Fig 6
(NH₄)₂SO₄
Na₂SO₄
NaCl

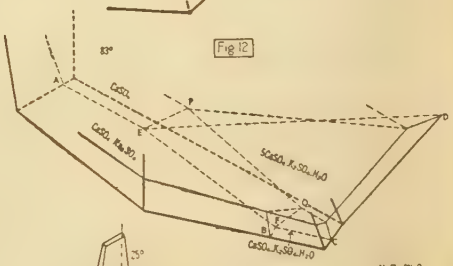


Fig 12
83°
CaSO₄
CaSO₄.Na₂SO₄
5CaSO₄.K₂SO₄.H₂O
CaSO₄.K₂SO₄.H₂O

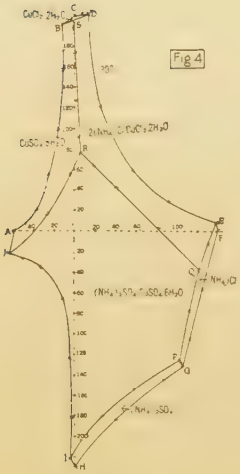


Fig 4
30°
CuSO₄.2H₂O
2(NH₄)₂SO₄.CuSO₄.6H₂O
(NH₄)₂SO₄
NH₄Cl

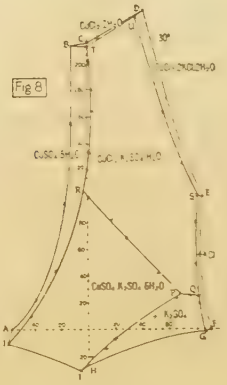


Fig 8
CuSO₄.2H₂O
CuSO₄.5H₂O
CuSO₄.K₂SO₄.6H₂O
K₂SO₄

Fig 9
0°
CaSO₄.2H₂O
CaSO₄.K₂SO₄.H₂O

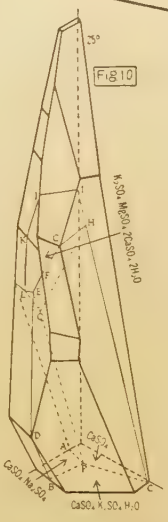


Fig 10
25°
K₂SO₄.MgSO₄.2CaSO₄.2H₂O
CaSO₄.Na₂SO₄
CaSO₄.K₂SO₄.H₂O

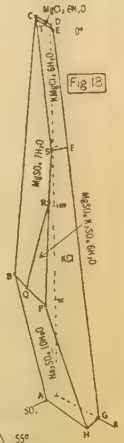


Fig 13
MgCl₂.6H₂O
MgSO₄.7H₂O
KCl
MgSO₄.K₂SO₄.6H₂O
NaCl

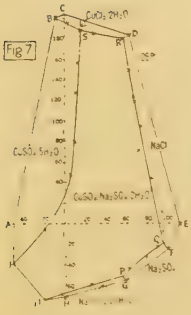


Fig 7
CuCl₂.2H₂O
CuSO₄.5H₂O
NaCl
CuSO₄.Na₂SO₄.2H₂O
Na₂SO₄

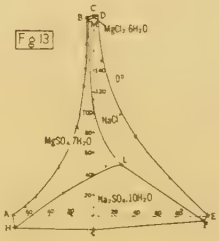


Fig 13
MgCl₂.6H₂O
NaCl
MgSO₄.7H₂O
Na₂SO₄.10H₂O

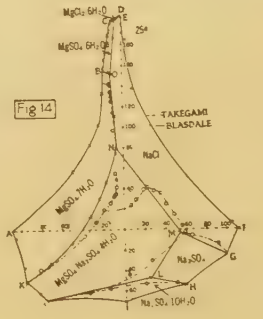


Fig 14
MgCl₂.6H₂O
MgSO₄.6H₂O
25°
TAKEGAMI
BLASDALE
NaCl
MgSO₄.7H₂O
MgSO₄.Na₂SO₄.4H₂O
Na₂SO₄
Na₂SO₄.10H₂O

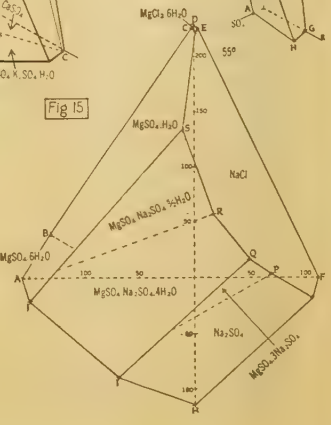


Fig 15
MgCl₂.6H₂O
55°
MgSO₄.H₂O
NaCl
MgSO₄.Na₂SO₄.½H₂O
MgSO₄.6H₂O
MgSO₄.Na₂SO₄.4H₂O
Na₂SO₄
MgSO₄.Na₂SO₄

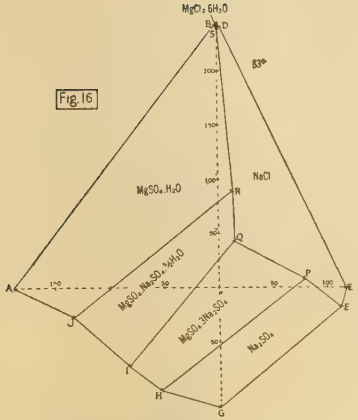


Fig. 16
MgCl2, 6H2O
83°
KMgCl3, 6H2O
MgSO4, H2O
NaCl
MgSO4, Na2SO4, 4H2O
MgSO4, 3Na2SO4
Na2SO4

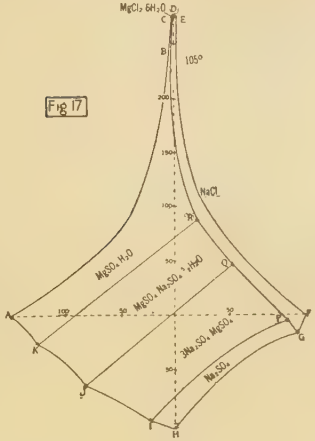


Fig 17
MgCl2, 6H2O
105°
NaCl
MgSO4, H2O
MgSO4, Na2SO4, 4H2O
3Na2SO4, MgSO4
Na2SO4

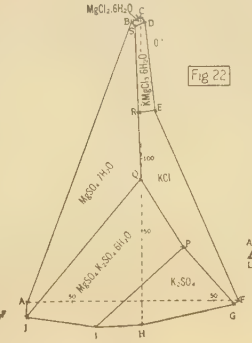


Fig 22
MgCl2, 6H2O
KMgCl3, 6H2O
MgSO4, H2O
KCl
MgSO4, K2SO4, 6H2O
K2SO4

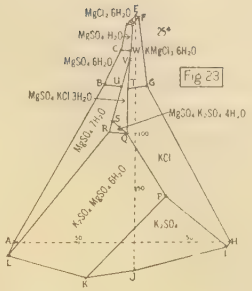


Fig 23
MgCl2, 6H2O
25°
MgSO4, H2O
KMgCl3, 6H2O
MgSO4, 6H2O
MgSO4, KCl, 3H2O
MgSO4, K2SO4, 4H2O
MgSO4, 7H2O
KCl
K2SO4, MgSO4, 6H2O
K2SO4

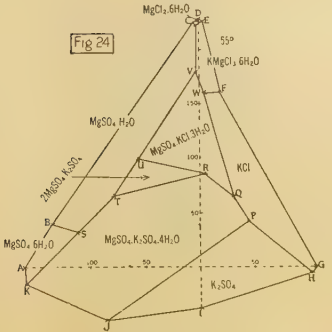


Fig 24
MgCl2, 6H2O
55°
KMgCl3, 6H2O
MgSO4, H2O
MgSO4, KCl, 3H2O
2MgSO4, K2SO4
KCl
MgSO4, 6H2O
MgSO4, K2SO4, 4H2O
K2SO4

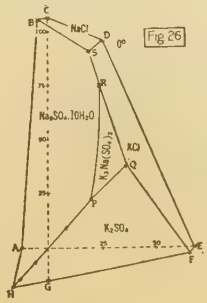


Fig 26
NaCl
0°
Na2SO4, 10H2O
K2Na(SO4)2
KCl
K2SO4

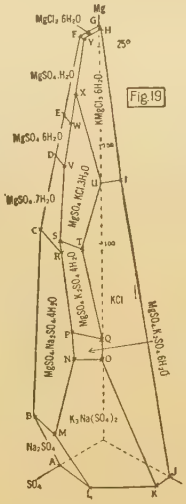


Fig 19
MgCl2, 6H2O
Mg
25°
MgSO4, H2O
KMgCl3, 6H2O
MgSO4, 6H2O
MgSO4, KCl, 3H2O
MgSO4, 7H2O
MgSO4, Na2SO4, 4H2O
MgSO4, K2SO4, 4H2O
KCl
MgSO4, K2SO4, 6H2O
K2Na(SO4)2
Na2SO4
SO4

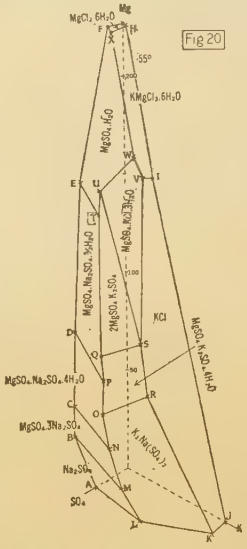


Fig 20
MgCl2, 6H2O
Mg
55°
KMgCl3, 6H2O
MgSO4, H2O
MgSO4, KCl, 3H2O
MgSO4, Na2SO4, 2½H2O
2MgSO4, K2SO4
KCl
MgSO4, K2SO4, 4H2O
MgSO4, Na2SO4, 4H2O
MgSO4, 3Na2SO4
K2Na(SO4)2
Na2SO4
SO4

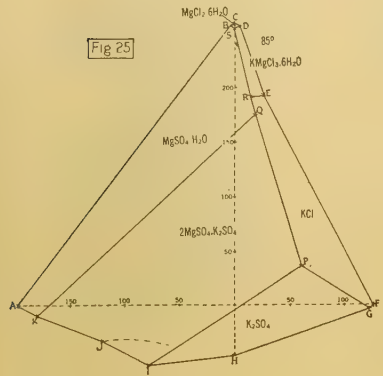


Fig 25
MgCl2, 6H2O
85°
KMgCl3, 6H2O
MgSO4, H2O
2MgSO4, K2SO4
KCl
K2SO4

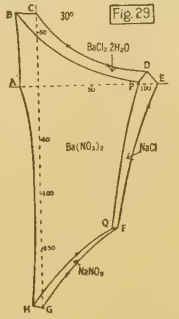


Fig 29
30°
BaCl2, 2H2O
Ba(NO3)2
NaCl
NaNO3

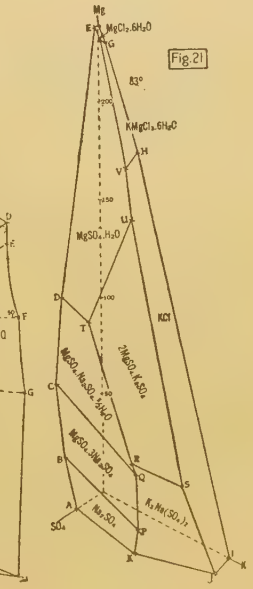


Fig 21
Mg
MgCl2, 6H2O
83°
KMgCl3, 6H2O
MgSO4, H2O
KCl
MgSO4, Na2SO4, 4H2O
2MgSO4, K2SO4
MgSO4, 3Na2SO4
K2Na(SO4)2
Na2SO4
SO4

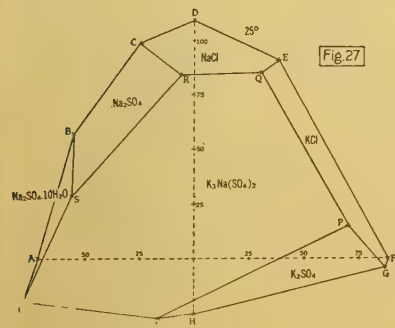


Fig 27
25°
NaCl
Na2SO4
KCl
Na2SO4, 10H2O
K3Na(SO4)2
K2SO4

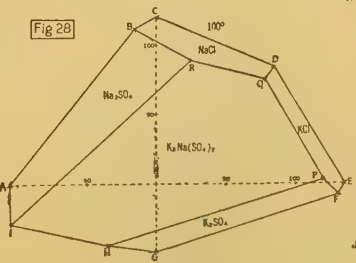


Fig 28
100°
NaCl
Na2SO4
KCl
K3Na(SO4)2
K2SO4

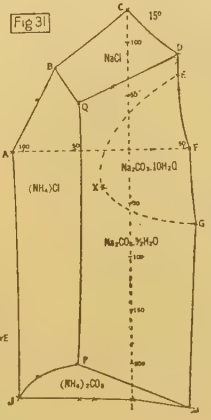


Fig 31
15°
NaCl
Na2CO3, 10H2O
(NH4)Cl
Na2CO3, ½H2O
(NH4)2CO3

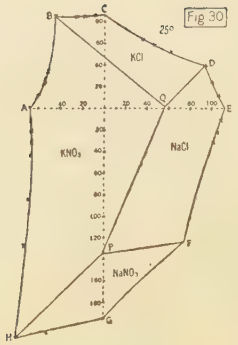


Fig 30
25°
KCl
KNO3
NaCl
NaNO3

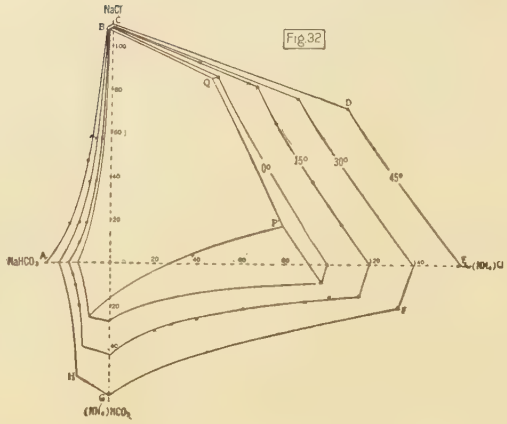


Fig 32
NaCl
NaHCO3
(NH4)Cl
(NH4)HCO3
0°
15°
30°
45°

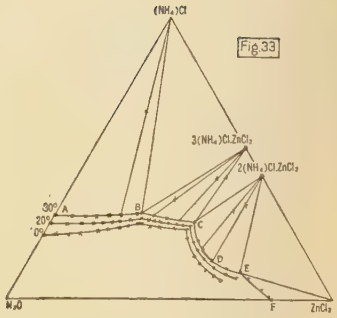


Fig 33
(NH4)Cl
3(NH4)Cl.ZnCl2
2(NH4)Cl.ZnCl2
ZnCl2

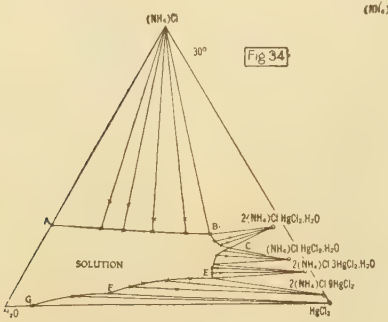


Fig 34
(NH4)Cl
30°
SOLUTION
HgCl2

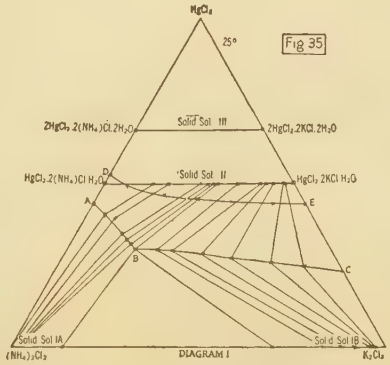


Fig 35
HgCl2
25°
Solid Sol III
Solid Sol II
Solid Sol IA
Solid Sol IB
DIAGRAM I

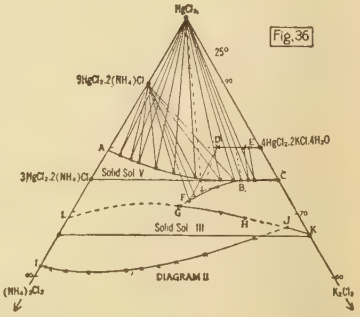


Fig 36
HgCl2
25°
Solid Sol V
Solid Sol III
DIAGRAM II

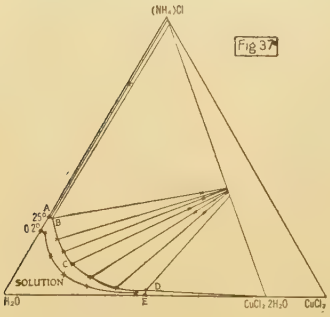


Fig 37
(NH4)Cl
25°
0°
SOLUTION
H2O
CuCl2 2H2O
CuCl2

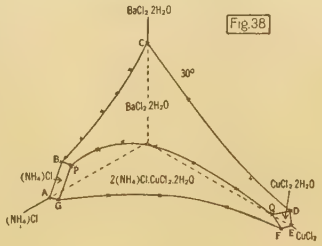


Fig 38
BaCl2 2H2O
30°
2(NH4)Cl.CuCl2.2H2O
CuCl2 2H2O
CuCl2

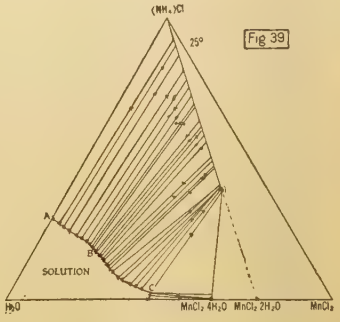


Fig 39
(NH4)Cl
25°
SOLUTION
H2O
MnCl2 4H2O
MnCl2 2H2O
MnCl2

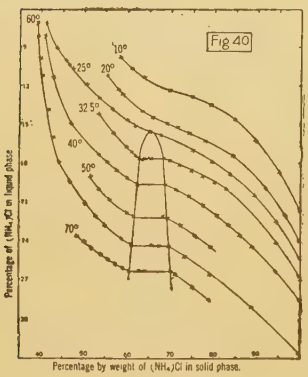


Fig 40
10°
20°
25°
32.5°
40°
50°
70°
Percentage of (NH4)Cl in liquid phase
Percentage by weight of (NH4)Cl in solid phase.

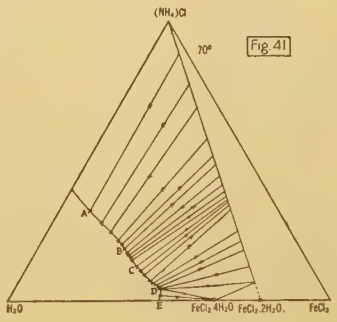


Fig 41
(NH4)Cl
70°
H2O
FeCl2 4H2O
FeCl2.2H2O.
FeCl2

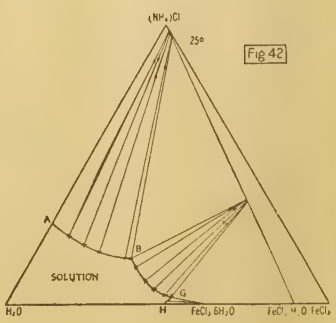
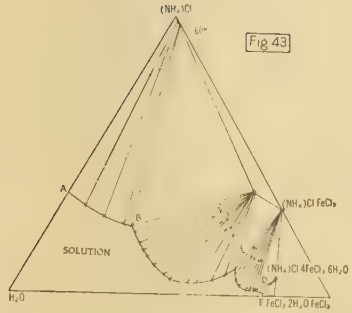
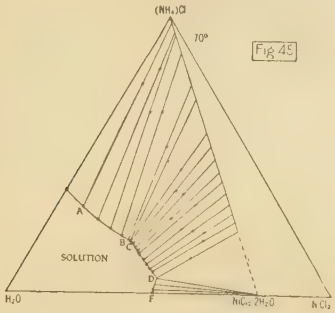
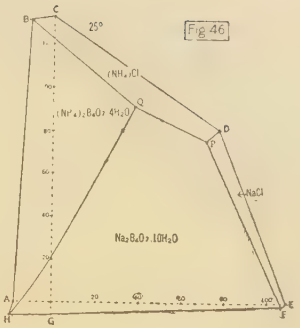
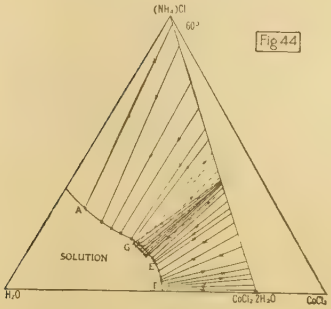


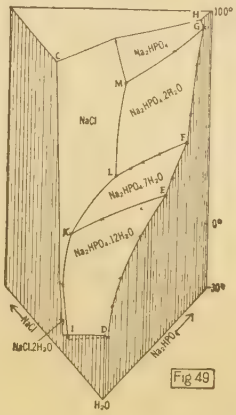
Fig 42
(NH4)Cl
25°
SOLUTION
H2O
FeCl2 6H2O
FeCl2


(NH₄)Cl
60°
Fig 43
SOLUTION
(NH₄)Cl FeCl₃
(NH₄)Cl 4FeCl₃ 6H₂O
H₂O
FeCl₃ 2H₂O FeCl₃


(NH₄)Cl
70°
Fig 45
SOLUTION
H₂O
NiCl₂ 2H₂O
NiCl₂


25°
Fig 46
(NH₄)Cl
(NH₄)₂S₂O₇ 4H₂O
NaCl
Na₂S₂O₇ 10H₂O


(NH₄)Cl
60°
Fig 44
SOLUTION
H₂O
CoCl₂ 2H₂O
CoCl₂


100°
Na₂HPO₄
Na₂HPO₄ 2H₂O
NaCl
Na₂HPO₄ 7H₂O
Na₂HPO₄ 12H₂O
0°
-10°
NaCl
NaCl 2H₂O
Na₂HPO₄
H₂O
Fig 49

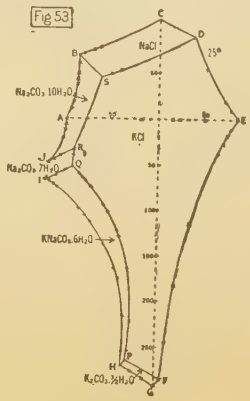
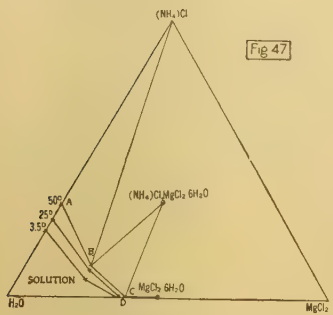


Fig 53
NaCl
25°
Na₂CO₃ 10H₂O
KCl
Na₂CO₃ 7H₂O
KHCO₃ 6H₂O
K₂CO₃ ½H₂O


(NH₄)Cl
Fig 47
50°
25°
35°
(NH₄)Cl MgCl₂ 6H₂O
SOLUTION
MgCl₂ 6H₂O
H₂O
MgCl₂

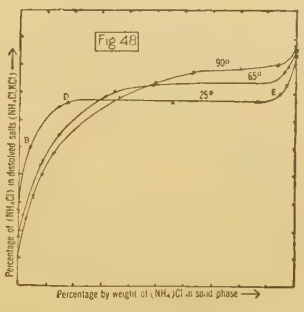
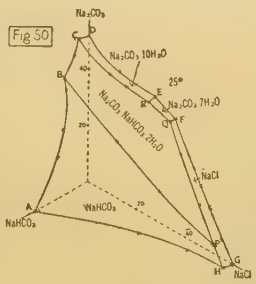


Fig 48
90°
65°
25°
Percentage of (NH₄)Cl in dissolved salts (NH₄Cl+KCl) →
Percentage by weight of (NH₄)Cl in solid phase →


Na₂CO₃
Fig 50
Na₂CO₃ 10H₂O
25°
Na₂CO₃ 7H₂O
Na₂CO₃ NaHCO₃ 2H₂O
NaCl
NaHCO₃
NaCl

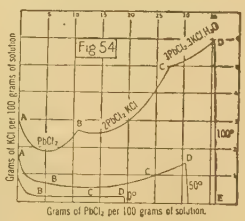


Fig 54
(PbCl₂)₃ KCl H₂O
(PbCl₂)₂ KCl
PbCl₂
100°
50°
Grams of KCl per 100 grams of solution
Grams of PbCl₂ per 100 grams of solution.

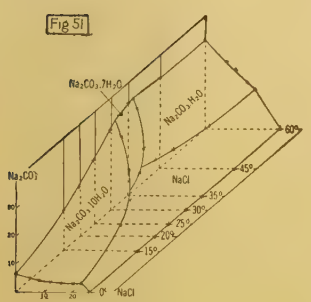


Fig 51
Na₂CO₃ 7H₂O
Na₂CO₃ H₂O
60°
Na₂CO₃
NaCl
45°
35°
30°
Na₂CO₃ 10H₂O
25°
20°
15°
0°
NaCl

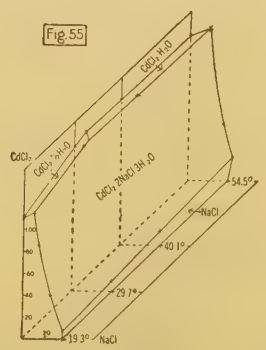


Fig 55
CdCl₂ H₂O
CdCl₂
CdCl₂ 2½H₂O
CdCl₂ NaCl 3H₂O
54.5°
NaCl
40.1°
29.7°
19.3°
NaCl

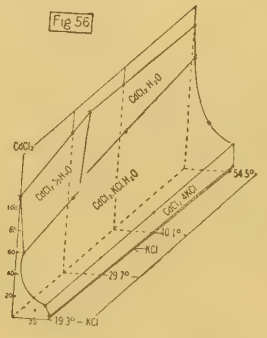


Fig 56
CdCl₂ H₂O
CdCl₂
CdCl₂ 2½H₂O
CdCl₂ KCl H₂O
54.5°
CdCl₂ KCl
40.1°
KCl
29.7°
19.3°
KCl

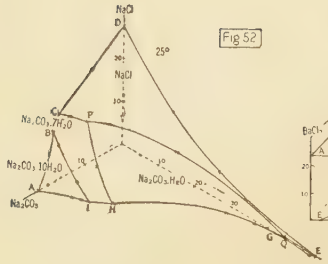


Fig. 52
NaCl
25°
NaCl
Na2CO3, 7H2O
Na2CO3, 10H2O
Na2CO3
Na2CO3, H2O

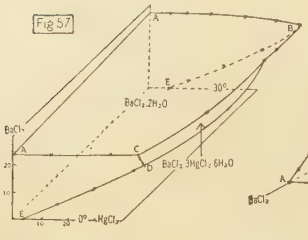


Fig. 57
BaCl2, 2H2O
30°
BaCl2, 3H2O, 6H2O
0° → MgCl2

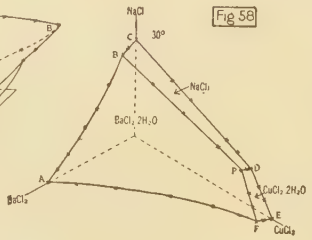


Fig. 58
NaCl
30°
NaCl
BaCl2, 2H2O
CuCl2, 2H2O
CuCl2

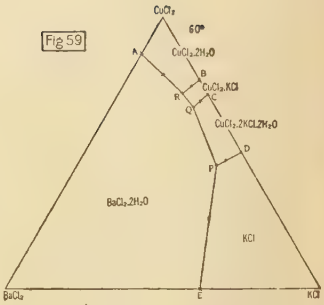


Fig. 59
CuCl2
60°
CuCl2, 2H2O
CuCl2, KCl
CuCl2, 2KCl, 2H2O
BaCl2, 2H2O
KCl
BaCl2
KCl

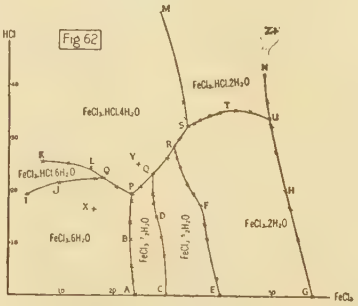


Fig. 62
HCl
FeCl3, HCl, 4H2O
FeCl3, HCl, 2H2O
FeCl3, HCl, 6H2O
FeCl3, 6H2O
FeCl3, 5H2O
FeCl3, 3H2O
FeCl3, 2H2O
FeCl3

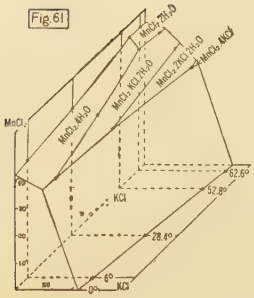


Fig. 61
MnCl2, 2H2O
MnCl2, 4H2O
MnCl2, KCl, 2H2O
MnCl2, 2KCl, 2H2O
MnCl2
KCl
62.6°
52.8°
28.4°
6°
KCl

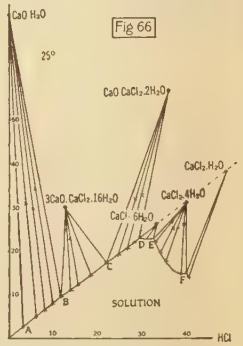


Fig. 66
CaO H2O
25°
CaO CaCl2, 2H2O
3CaO. CaCl2, 16H2O
CaCl2, 6H2O
CaCl2, 4H2O
CaCl2, H2O
SOLUTION
HCl

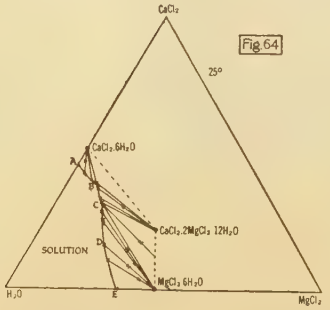


Fig. 64
CaCl2
25°
CaCl2, 6H2O
CaCl2, 2MgCl2, 12H2O
SOLUTION
MgCl2, 6H2O
H2O
MgCl2

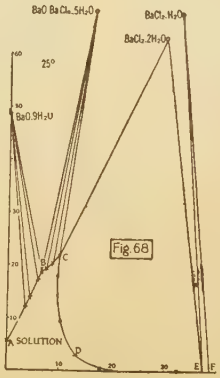


Fig. 68
BaO Ba Cl2, 5H2O
BaCl2, H2O
BaCl2, 2H2O
25°
BaO. 9H2O
SOLUTION

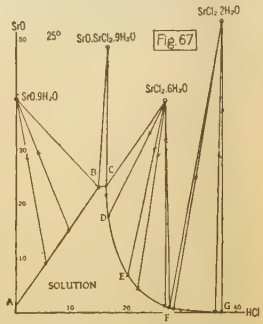


Fig. 67
SrO
25°
SrO. SrCl2, 9H2O
SrCl2, 2H2O
SrO. 9H2O
SrCl2, 6H2O
SOLUTION
HCl

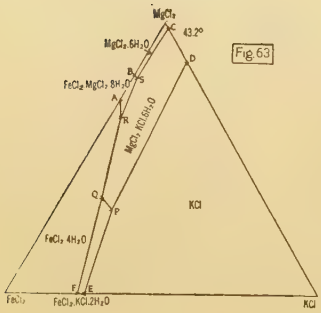


Fig. 63
MgCl2
43.2°
MgCl2, 6H2O
FeCl2, MgCl2, 8H2O
MgCl2, KCl, 6H2O
FeCl2, 4H2O
KCl
FeCl2
FeCl2, KCl, 2H2O
KCl

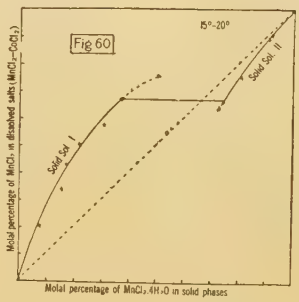


Fig. 60
15°-20°
Solid Sol. I
Solid Sol. II
Molal percentage of MnCl2, in dissolved salts (MnCl2—CdCl2)
Molal percentage of MnCl2, 4H2O in solid phases

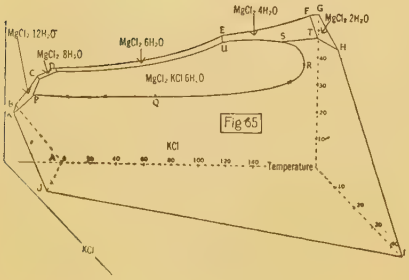


Fig. 65
MgCl2, 12H2O
MgCl2, 8H2O
MgCl2, 6H2O
MgCl2, 4H2O
MgCl2, 2H2O
MgCl2, KCl 6H2O
KCl
Temperature
KCl

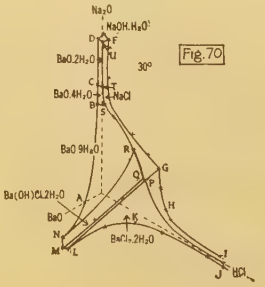


Fig. 70
Na2O
NaOH. H2O
30°
BaO. 2H2O
BaO. 4H2O
NaCl
BaO. 9H2O
Ba(OH)Cl. 2H2O
BaO
BaCl2, 2H2O
HCl

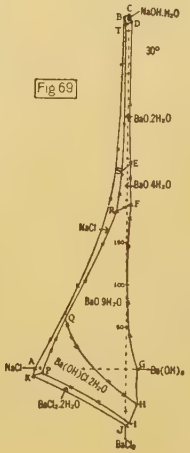


Fig. 69
NaOH. H2O
30°
BaO. 2H2O
BaO. 4H2O
NaCl
BaO. 9H2O
Ba(OH)2, 2H2O
Ba(OH)2
BaCl2, 2H2O
BaCl2

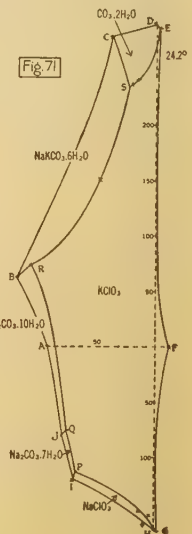


Fig. 71
CO3, 2H2O
24.2°
NaKCO3, 6H2O
KClO3
Na2CO3, 10H2O
Na2CO3, 7H2O
NaClO3

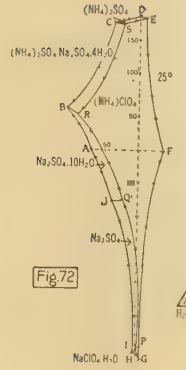


Fig. 72

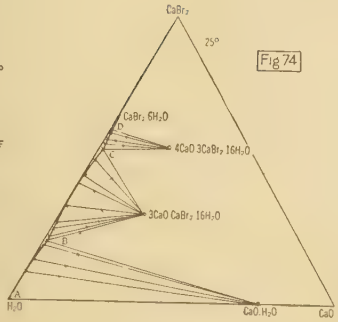


Fig. 74

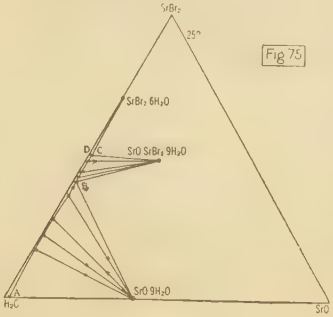
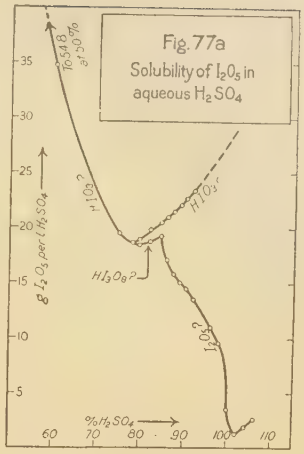


Fig. 75



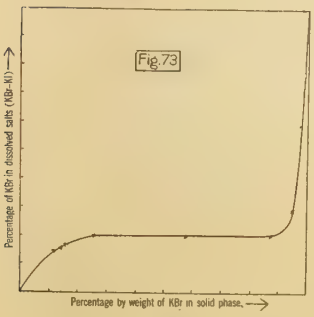



Fig. 73

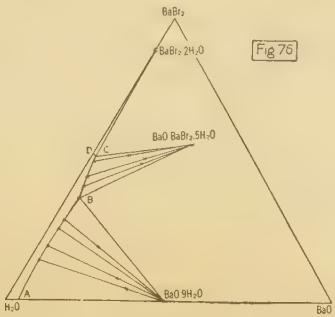


Fig. 76

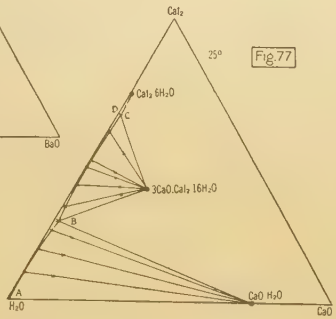


Fig. 77

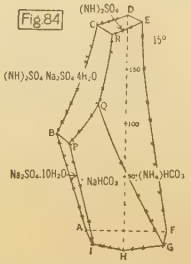


Fig. 84

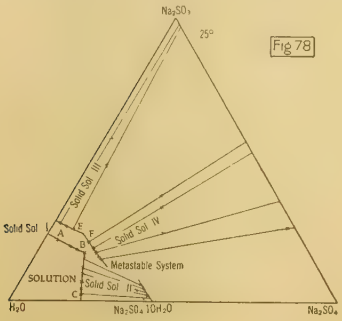


Fig. 78

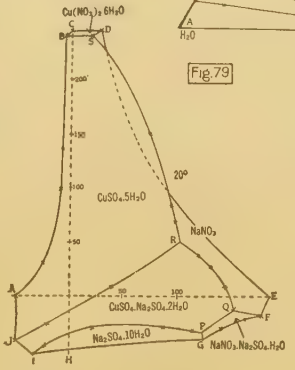


Fig. 79

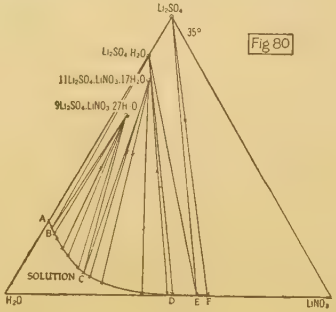


Fig. 80

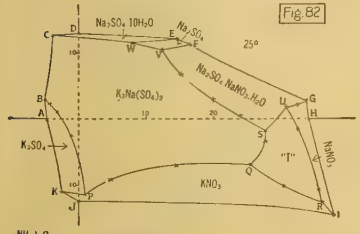


Fig. 82

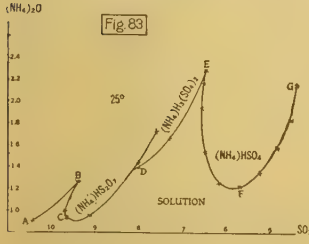


Fig. 83

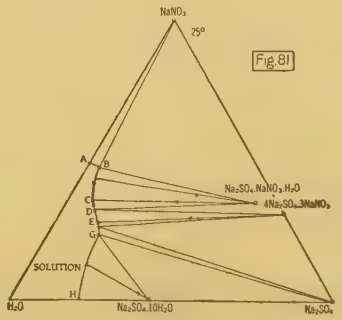


Fig. 81

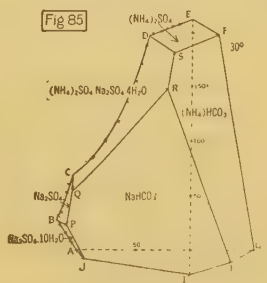


Fig. 85

Fig 86

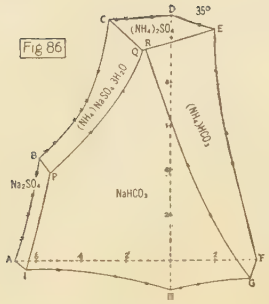



Fig 87

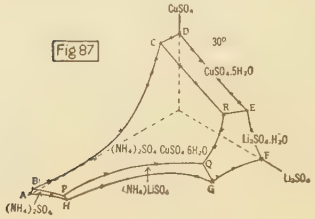



Fig 89

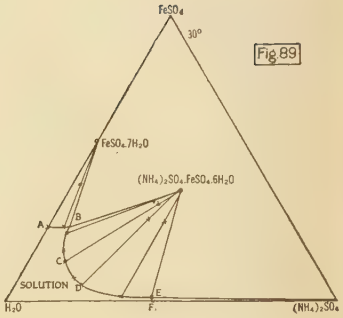



Fig 98

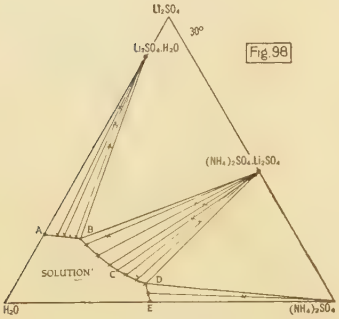



Fig 92

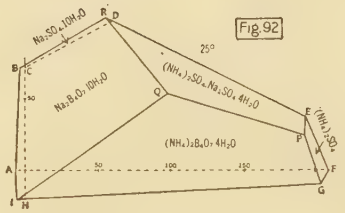



Fig 90

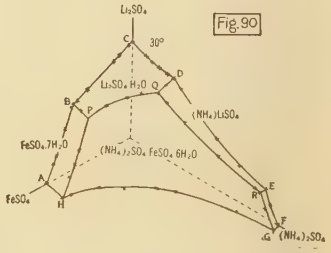



Fig 91

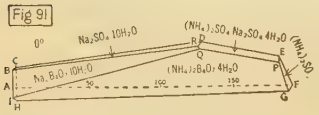



Fig 93

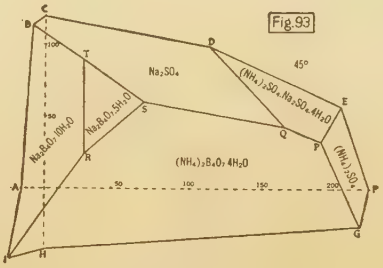



Fig 94

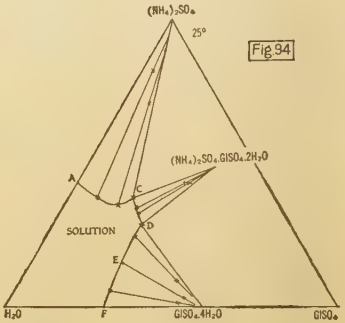



Fig 97

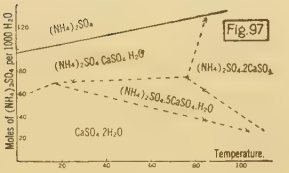



Fig 95

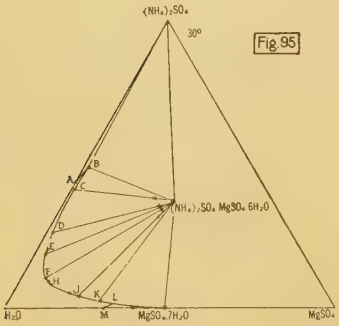



Fig 96

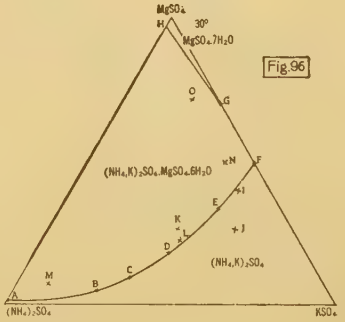



Fig 88

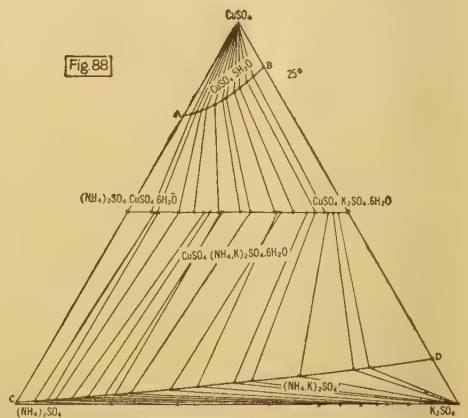


Fig. 99

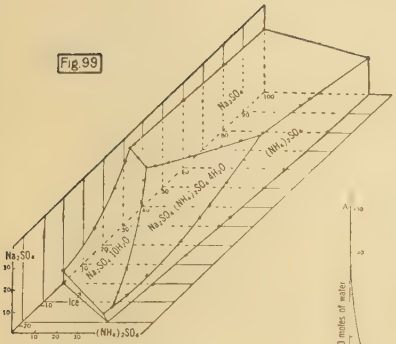
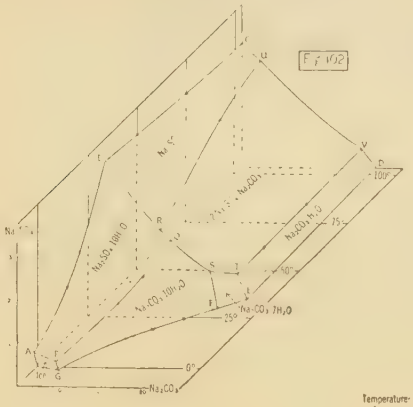



Fig. 102



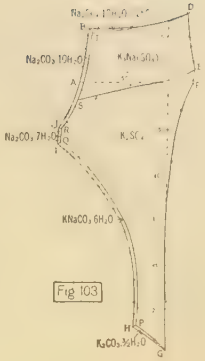




Fig. 103

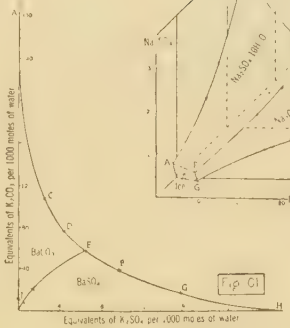



Fig. 101

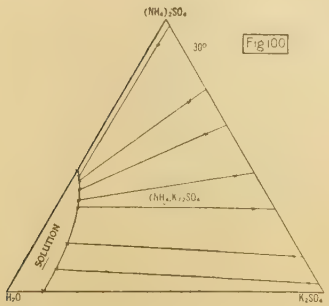



Fig. 100

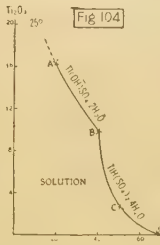



Fig. 104

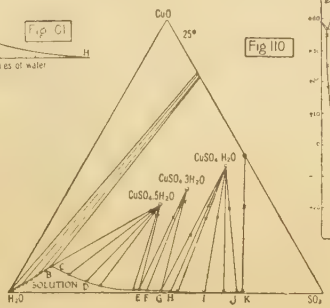



Fig. 110

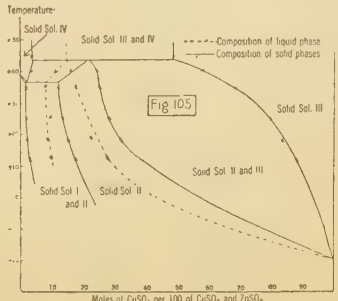



Fig. 105

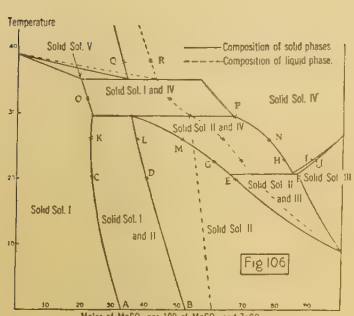



Fig. 106

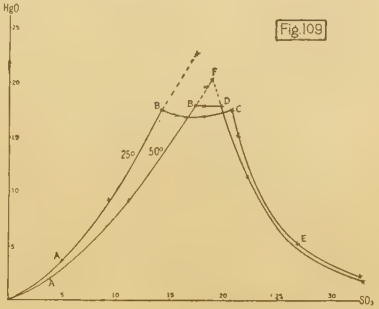



Fig. 109

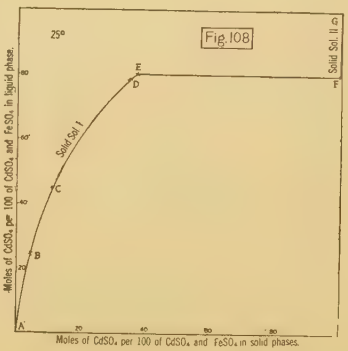



Fig. 108

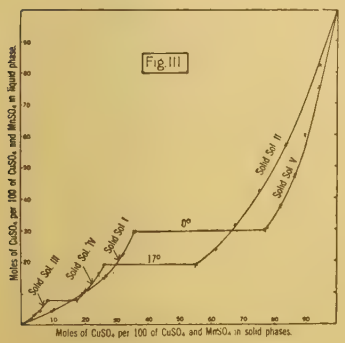



Fig. 111

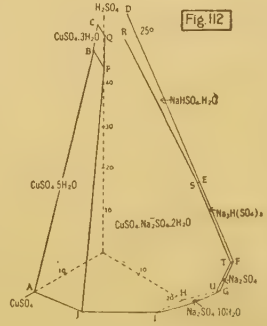



Fig. 112

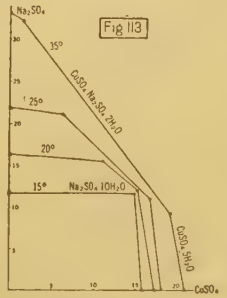



Fig. 113

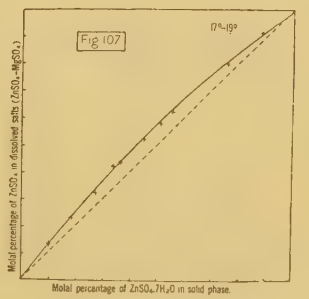



Fig. 107

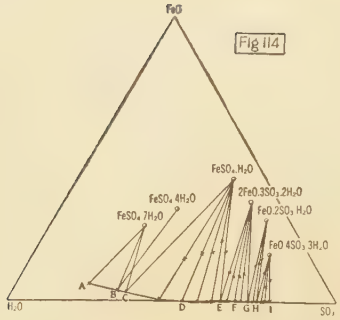


Fig 114
FeO
FeSO4.H2O
FeSO4.4H2O
FeSO4.7H2O
2FeO.3SO3.2H2O
FeO.2SO3.H2O
FeO.4SO3.3H2O
H2O
SO3

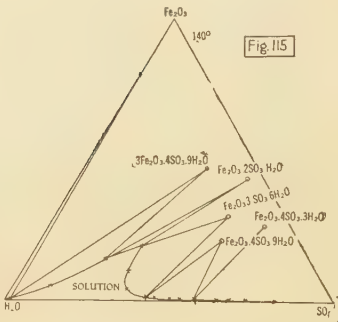


Fig 115
Fe2O3
140°
3Fe2O3.4SO3.9H2O
Fe2O3.2SO3.H2O
Fe2O3.3SO3.6H2O
Fe2O3.4SO3.3H2O
Fe2O3.4SO3.9H2O
SOLUTION
H2O
SO3

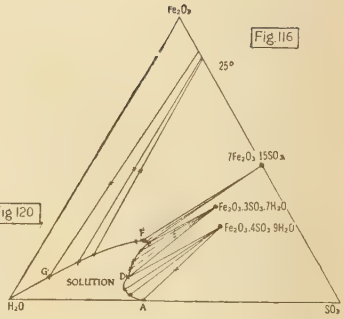


Fig 116
Fe2O3
25°
7Fe2O3.15SO3
Fe2O3.3SO3.7H2O
Fe2O3.4SO3.9H2O
SOLUTION
H2O
SO3

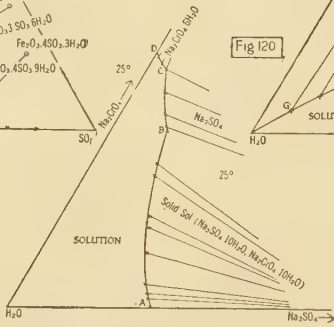


Fig 120
Na2CrO4.6H2O
25°
Na2SO4
25°
Solid Sol (Na2SO4.10H2O, Na2CrO4.10H2O)
SOLUTION
H2O
Na2SO4
Na2CrO4

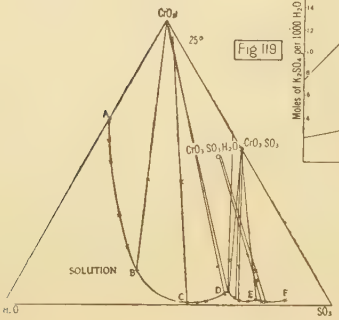


Fig 119
CrO3
25°
CrO3.SO3.H2O
CrO3.SO3
SOLUTION
H2O
SO3

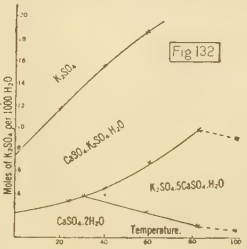


Fig 132
Moles of K2SO4 per 1000 H2O
K2SO4
CaSO4.K2SO4.H2O
K2SO4.5CaSO4.H2O
CaSO4.2H2O
Temperature.

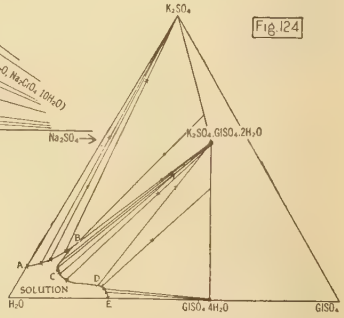


Fig 124
K2SO4
K2SO4.GlSO4.2H2O
SOLUTION
H2O
GlSO4.4H2O
GlSO4

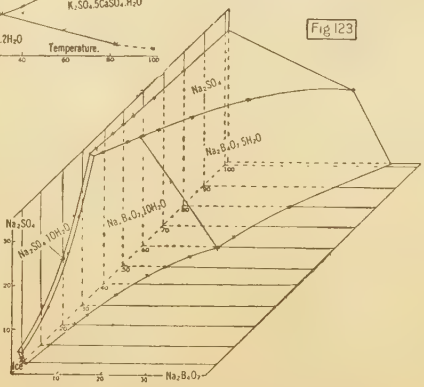


Fig 123
Na2SO4
Na2SO4.10H2O
Na2B4O7.5H2O
Na2B4O7.10H2O
Na2B4O7

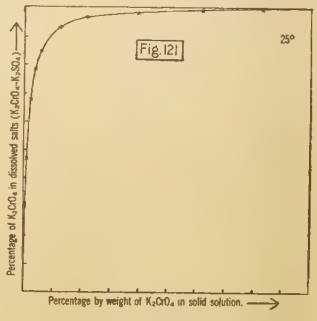


Fig 121
25°
Percentage of K2CrO4 in dissolved salts (K2CrO4+K2SO4)
Percentage by weight of K2CrO4 in solid solution.

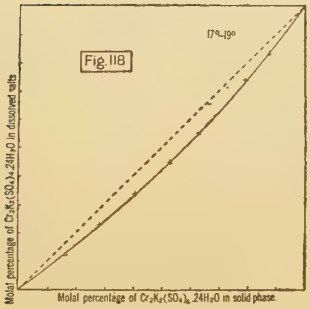


Fig 118
17°-19°
Molal percentage of Cr2K2(SO4)4.24H2O in dissolved salts
Molal percentage of Cr2K2(SO4)4.24H2O in solid phase.

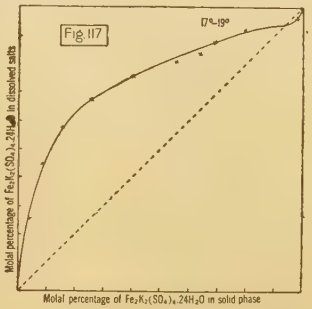


Fig 117
17°-19°
Molal percentage of Fe2K2(SO4)4.24H2O in dissolved salts
Molal percentage of Fe2K2(SO4)4.24H2O in solid phase

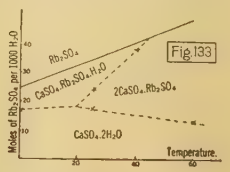


Fig 133
Moles of Rb2SO4 per 1000 H2O
Rb2SO4
CaSO4.Rb2SO4.H2O
2CaSO4.Rb2SO4
CaSO4.2H2O
Temperature.

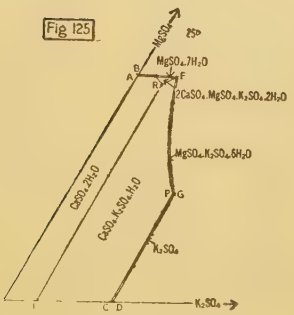


Fig 125
MgSO4
25°
MgSO4.7H2O
2CaSO4.MgSO4.K2SO4.2H2O
MgSO4.K2SO4.6H2O
CaSO4.2H2O
CaSO4.K2SO4.H2O
K2SO4
K2SO4

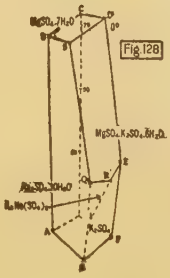


Fig 128
MgSO4.7H2O
MgSO4.K2SO4.6H2O

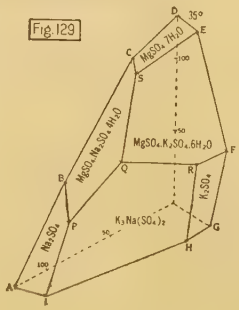


Fig 129
35°
MgSO4.7H2O
MgSO4.Na2SO4.4H2O
MgSO4.K2SO4.6H2O
K2SO4
Na2SO4
K2Na(SO4)2

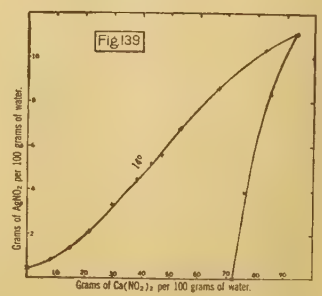


Fig 139
14°
Grams of AgNO3 per 100 grams of water.
Grams of Ca(NO3)2 per 100 grams of water.

Fig. 127

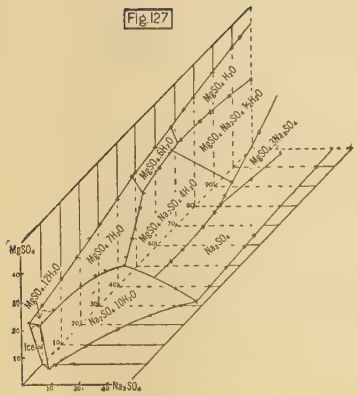



Fig. 130

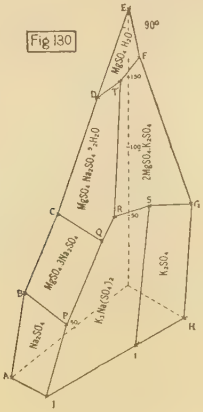



Fig. 131

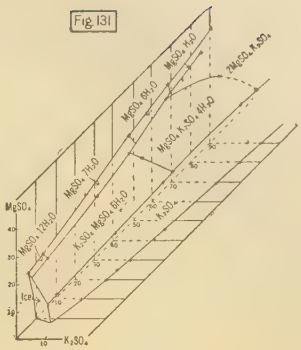



Fig. 126

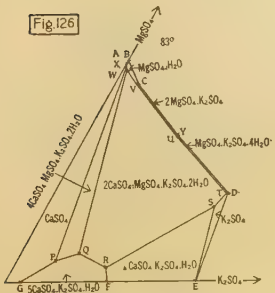



Fig. 134

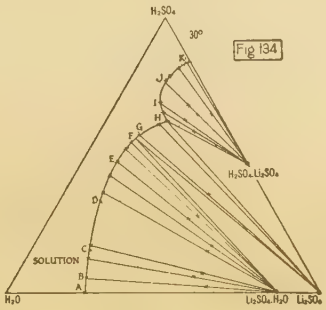



Fig. 137

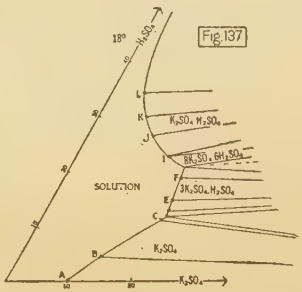



Fig. 135

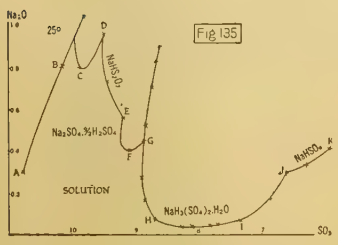



Fig. 136

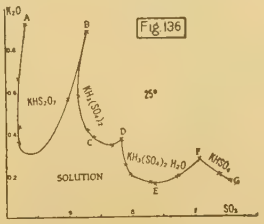



Fig. 142

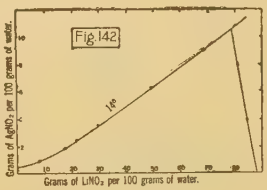



Fig. 140

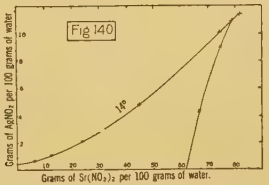



Fig. 143

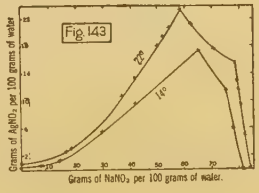



Fig. 138

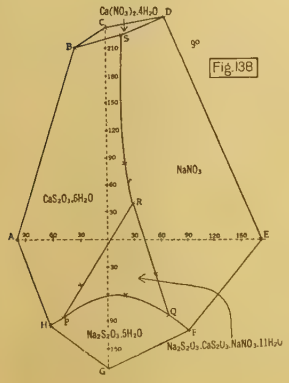



Fig. 141

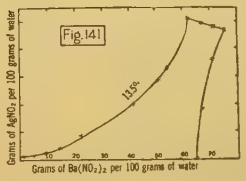



Fig. 145

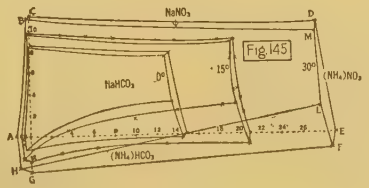
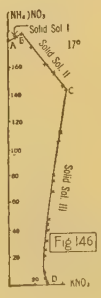



Fig. 146



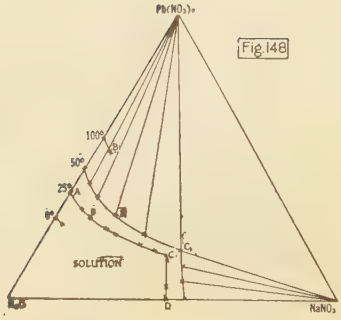


Fig. 148

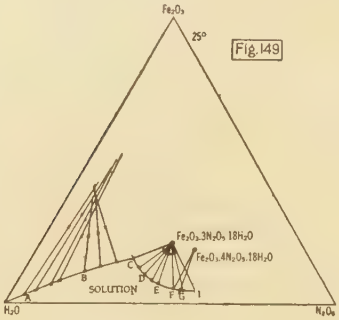


Fig. 149

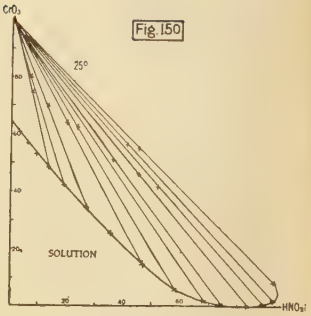


Fig. 150

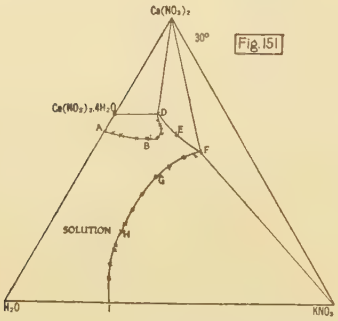


Fig. 151

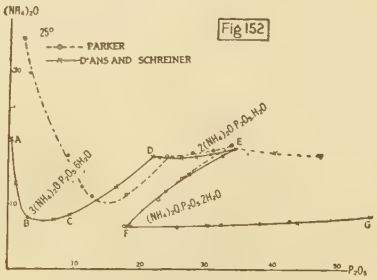


Fig. 152

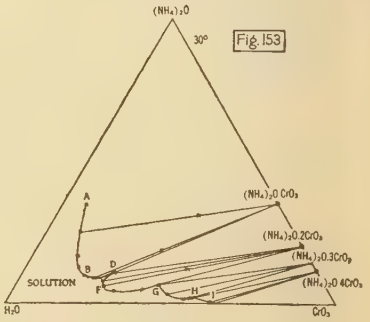
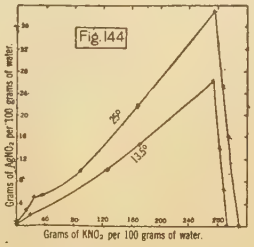


Fig. 153



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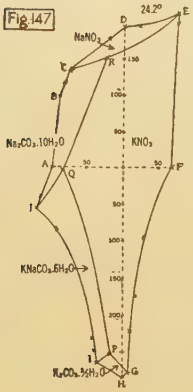


Fig. 147

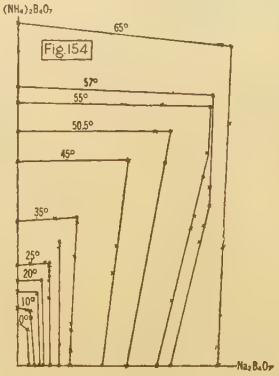


Fig. 154

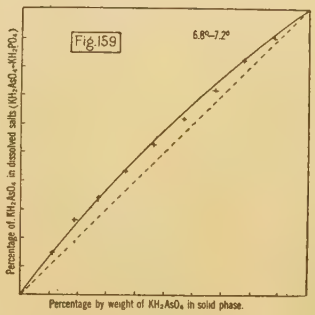


Fig. 159

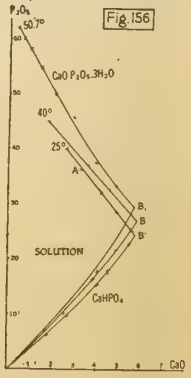


Fig. 156

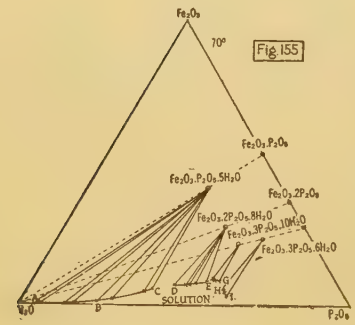


Fig. 155

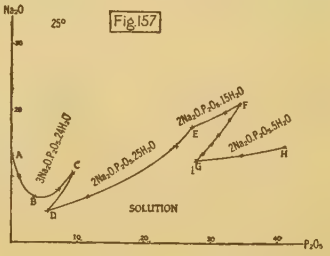


Fig. 157

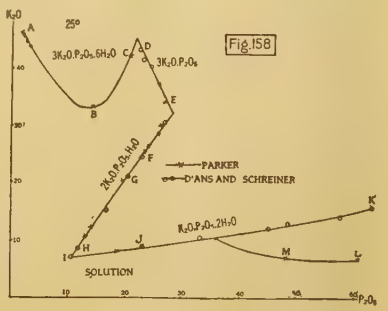


Fig. 158

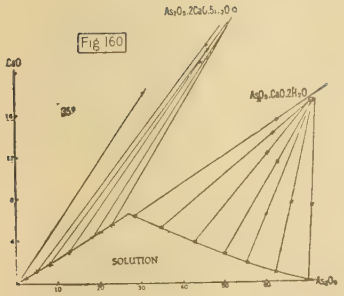


Fig 160
CaO
As₂O₅.2CaO.5H₂O
As₂O₅.CaO.2H₂O
SOLUTION
As₂O₅

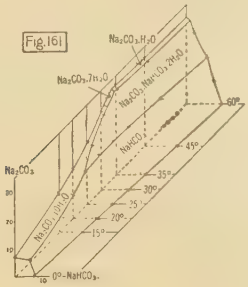


Fig.161
Na₂CO₃.H₂O
Na₂CO₃.7H₂O
Na₂CO₃.NaHCO₃.2H₂O
NaHCO₃
Na₂CO₃
Na₂CO₃.10H₂O
0°-NaHCO₃
60°
45°
35°
30°
25°
20°
15°

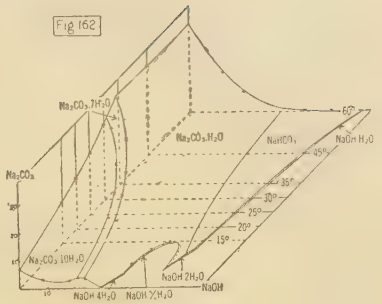


Fig 162
Na₂CO₃.7H₂O
Na₂CO₃.H₂O
NaHCO₃
NaOH H₂O
Na₂CO₃
Na₂CO₃.10H₂O
NaOH 4H₂O
NaOH ½H₂O
NaOH 2H₂O
NaOH
60°
45°
35°
30°
25°
20°
15°

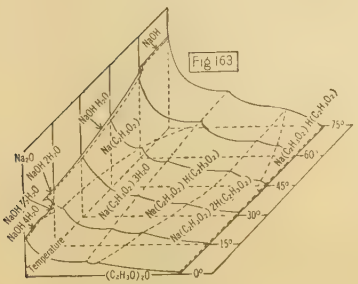


Fig 163
NaOH
NaOH H₂O
Na₂O
NaOH 2H₂O
NaOH ½H₂O
NaOH 4H₂O
Temperature
(C₂H₃O)₂O
0°
15°
30°
45°
60°
75°

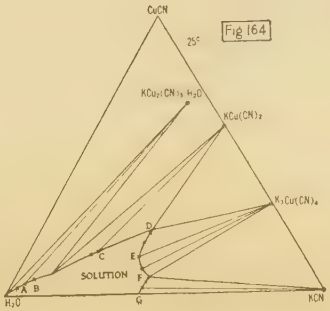


Fig 164
CuCN
25°
KCu₂(CN)₃.H₂O
KCu(CN)₂
K₃Cu(CN)₄
SOLUTION
H₂O
KCN

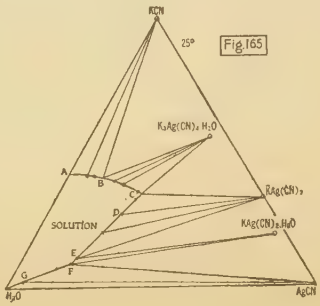


Fig.165
KCN
25°
K₃Ag(CN)₄.H₂O
KAg(CN)₂
KAg(CN)₂.H₂O
SOLUTION
H₂O
AgCN

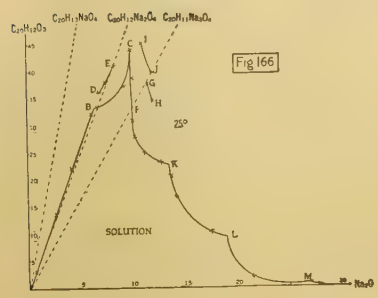


Fig 166
C₂₀H₁₂O₃
C₂₀H₁₃NaO₄
C₂₀H₁₂Na₂O₄
C₂₀H₁₁Na₂O₄
25°
SOLUTION
Na₂O

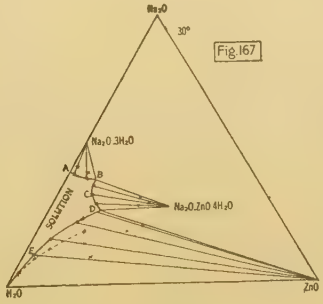


Fig.167
Na₂O
30°
Na₂O.3H₂O
Na₂O.ZnO.4H₂O
SOLUTION
H₂O
ZnO

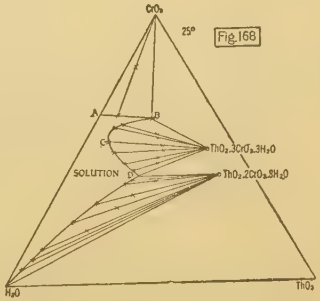


Fig.168
CrO₃
25°
ThO₂.3CrO₃.3H₂O
ThO₂.2CrO₃.5H₂O
SOLUTION
H₂O
ThO₂

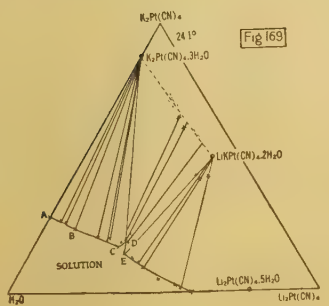


Fig 169
K₂Pt(CN)₄
24.1°
K₂Pt(CN)₄.3H₂O
LiKPt(CN)₄.2H₂O
SOLUTION
Li₂Pt(CN)₄.5H₂O
H₂O
Li₂Pt(CN)₄

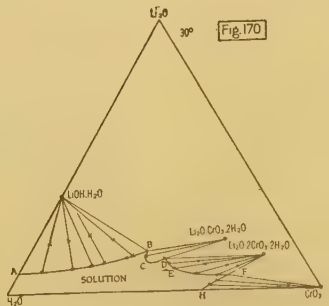


Fig.170
Li₂O
30°
LiOH.H₂O
Li₂O.CrO₃.2H₂O
Li₂O.2CrO₃.2H₂O
SOLUTION
H₂O
CrO₃

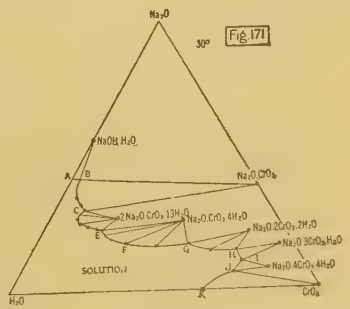
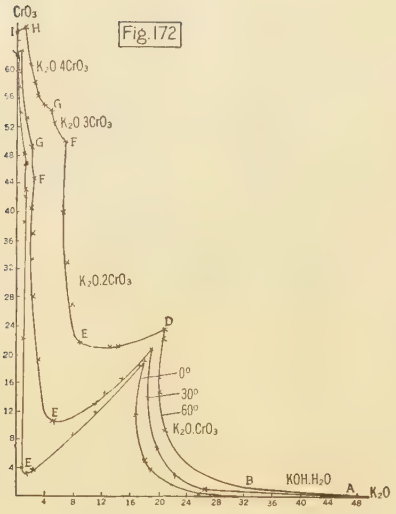
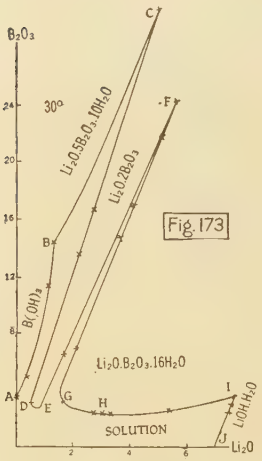
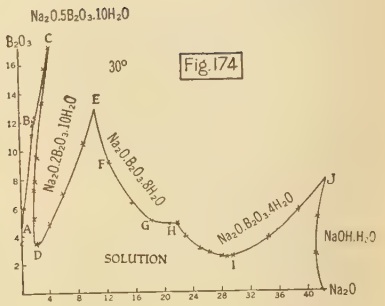
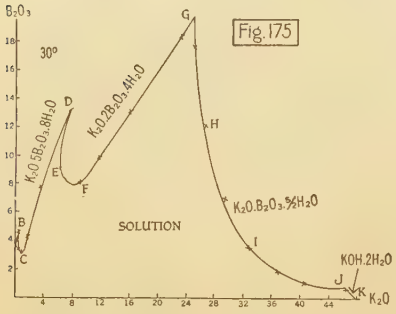


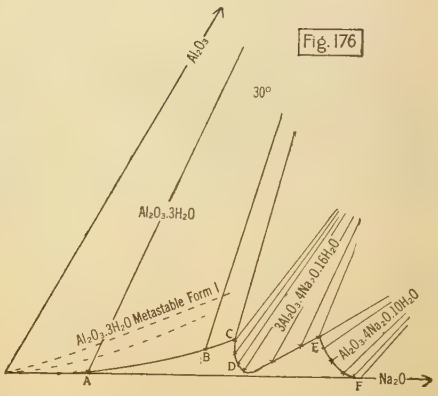
Fig.171
Na₂O
30°
NaOH.H₂O
Na₂O.CrO₃
2Na₂O.CrO₃.13H₂O
Na₂O.CrO₃.4H₂O
Na₂O.2CrO₃.2H₂O
Na₂O.3CrO₃.H₂O
Na₂O.4CrO₃.4H₂O
SOLUTION
H₂O
CrO₃




(210) Hoitsema, *7*, **17**: 651; 95. (211) Hoitsema, *7*, **27**: 312; 98. (212) Hollmann, *7*, **37**: 193; 01. (213) Hollmann, *7*, **54**: 98; 05. (214) Iljinski, *Ann. l'inst. d'analyse phys. chim., Leningrad*, **2**: 50, 54; 23. (215) Inamura, *429*, **4**: 105; 19. (215.5) Ishikawa, *41B*, **1**: 139; 26. (216) Iwaki, *429*, **1**: 81: 14. (217) Jackman and Browne, *4*, **121**: 694; 22. (218) Jackson, *1*, **36**: 2346; 14. (219) Jänecke, *93*, **71**: 1; 11.

(220) Jänecke, *93*, **100**: 176; 17. **102**: 41; 18. **103**: 1; 18. (221) James and Holden, *1*, **35**: 559; 13. (222) James and Whittemore, *1*, **34**: 1168; 12. (223) James, Whittemore and Holden, *1*, **36**: 1853; 14. (224) Jehu and Hudleston, *4*, **125**: 1451; 24. (225) Joseph, *4*, **117**: 377; 20. (226) Kasarnowsky, *7*, **109**: 287; 24. (227) Kazaneckii, *53*, **46**: 1110; 14. (228) Kendricks, *50*, **12**: 693; 08. (229) Keyes and James, *1*, **36**: 634; 14.

(230) Klein, *93*, **74**: 157; 11. (231) van Klooster, *50*, **21**: 513; 17. (232) Koppel, *7*, **42**: 1; 02. (233) Koppel, *7*, **52**: 385; 05. (234) Koppel and Blumenthal, *93*, **53**: 228; 07. (235) Koppel and Holtkamp, *95*, **67**: 266; 10. (236) Kremann and Noss, *57*, **33**: 1205; 12. (237) Kremann and Rodemund, *93*, **86**: 373; 14. (238) Kremann and Zitek, *75*, **118 IIb**: 59; 09. (239) Küster and Thiel, *93*, **21**: 116; 99.

(240) Kurnakov and Zhemchuzhnui, *53*, **51**: 1; 19. (241) Kurnakov and Zhemchuzhnui, *93*, **140**: 149; 24. (242) Lamb and Phillips, *1*, **45**: 108; 23. (243) Le Chatelier, *34*, **100**: 737; 85. (244) Lee and Egerton, *4*, **123**: 706; 23. (245) van Leeuwen, *7*, **23**: 33; 97. (246) Lind, Underwood and Whittemore, *1*, **40**: 465; 18. (247) Lipscomb and Hulett, *50*, **20**: 75; 16. (248) Löwenherz, *7*, **13**: 491; 94. (249) Lowry, *5*, **91**: 53; 15.

(250) Lunge, *54*, **4**: 31; 85. (251) McCoy and Test, *1*, **33**: 473; 11. (252) Maeda and Yamane, *210*, **4**: 85; 26. (253) Malquori, *36*, **56**: 37; 26. (254) Marden, *1*, **38**: 310; 16. (255) Massink, *7*, **92**: 351; 17. (256) Masson, *4*, **99**: 1132; 11. (257) Mayeda, *41*, **23**: 573; 20. (258) Meerburg, *93*, **37**: 199; 03. (259) Meerburg, *93*, **45**: 1; 05.

(260) Meerburg, *93*, **45**: 324; 05. (261) Meerburg, *93*, **59**: 136; 08. (262) Meijer, *70*, **43**: 397; 24. (263) Meyer, *70*, **42**: 301; 23. (264) Meyer and Stateczny, *93*, **122**: 1; 22. (265) Meyer, Wassjuchnow, Drapier and Bodländer, *93*, **86**: 258; 14. (266) Meyer and Wilk, *93*, **132**: 239; 24. (267) Meyerhoffer, *7*, **3**: 336; 89. **5**: 97; 90. (268) Meyerhoffer, *7*, **53**: 513; 05. (269) Meyerhoffer and Saunders, *7*, **28**: 453; 99.

(270) Milikan, *7*, **92**: 59; 18. (271) Milikan, *7*, **92**: 499; 18. (272) Milligan, *1*, **44**: 567; 22. (273) Mondain-Monval, *34*, **174**: 1014; 22. **175**: 162; 22. (274) Moser, *95*, **61**: 379; 09. (275) Müller, *7*, **110**: 365; 24. (276) Mumford and Gilbert, *4*, **123**: 471; 23. (277) Muthmann and Kuntze, *94*, **23**: 368; 94. (278) Nichols and Howes, *152*, No. **298**: 212; 19. (279) Nishizawa, *142*, **23**: 25; 20.

(280) Noyes, Boggs, Farrell and Stewart, *1*, **33**: 1650; 11. (281) Noyes and Bray, *1*, **33**: 1643; 11. (282) Noyes and Chow, *1*, **40**: 739; 18. (283) Noyes and Clement, *7*, **13**: 412; 94. (284) Noyes, Hall and Beattie, *1*, **39**: 2526; 17. (285) Noyes and Seidensticker, *11*, **21**: 217; 99. (286) Okazawa, *41*, **41**: 602; 20. (287) Osaka, *479*, **1**: 93; 08. (288) Osaka, *479*, **3**: 58; 11. (289) Osaka, *70*, **42**: 594; 23.

(290) Osaka and Ando, *7*, **110**: 786; 24. (291) Osaka, Shima and Yoshida, *429*, **7**: 69; 24. (292) Osaka and Yoshida, *429*, **6**: 49; 22. (293) Ostwald, *14*, **1**: 32; 14. (294) Parker, *50*, **18**: 653; 14. (295) Parsons and Corson, *1*, **32**: 1383; 10. (296) Parsons and Perkins, *1*, **32**: 1387; 10. (297) Pelling and Robertson, *South African Journal of Science*, **20**: 236; 23. (298) Pellini, *36*, **40 II**: 37; 10. (299) Poma, *36*, **40 I**: 193; 10.

(300) Posnjak and Merwin, *1*, **44**: 1965; 22. (301) Prandtl and Ducrue, *93*, **150**: 105; 26. (302) Pratt and James, *1*, **33**: 488; 11. (303) Precht and Wittjen, *25*, **14**: 1667; 81. (304) Raffo and Rossi, *36*, **45 I**: 45; 15. (305) Rakovskij and Dobrzinskij, *Ann. inst. réac. chim. pures., Leningrad*, **1**: 203; 23. (306) Recoura, *6*, **12**: 263; 07. (307) Reinders, *93*, **93**: 202; 15. (308) Richards and Kelley, *1*, **33**: 847; 11. (309) Richards and Wrede, *65*, **43**: 343; 07.

(310) Riesenfeld and Feld, *93*, **116**: 213; 21. (311) Rivett, *4*, **121**: 379; 22. (312) Rivett and Clendinnen, *4*, **123**: 1634; 23. (313) Rivett and Lewis, *70*, **42**: 954; 23. (314) Rivett and O'Connor, *4*, **115**: 1346; 19. (315) Robinson and Waggaman, *50*, **13**: 673; 09. (316) Rosenheim and Grünbaum, *93*, **61**: 187; 09. (317) Rosenheim and Pritze, *93*, **63**: 275; 09. (318) Ruff and Schiller, *93*, **72**: 329; 11. (319) Sackur and Taegener, *9*, **18**: 718; 12.

(320) Sahmen, *7*, **54**: 111; 05. (321) Sakabe, *429*, **1**: 57; 14. (322) Saxton, *45*, **14**: 281; 22. (323) Sborgi, *22*, **22 I**: 90; 13. (324) Sborgi, *22*, **22 I**: 715; 13. (325) Sborgi, *36*, **5a**: 946; 24. (326) Sborgi and Bovalini, *36*, **54**: 919; 24. (327) Sborgi, Bovalini and Cappellini, *36*, **54**: 298; 24. (328) Sborgi,

Bovalini and Medici, *36*, **54**: 934; 24. (329) Sborgi and Franco, *36*, **51** II: 1; 21.
(330) Sborgi and Gallichi, *36*, **54**: 255; 24. (331) Sborgi and Gallichi, *36*, **54**: 283; 24. (332) Sborgi and Stefanini, *36*, **54**: 322; 24. (333) Schaper, *7*, **72**: 308; 10. (334) Schreinemakers, *7*, **9**: 55; 92. **10**: 476; 92. (335) Schreinemakers, *7*, **12**: 73; 93. (336) Schreinemakers, *7*, **55**: 71; 06. (337) Schreinemakers, *7*, **59**: 641; 07. (338) Schreinemakers, *7*, **66**: 687; 09. (339) Schreinemakers, *7*, **68**: 83; 09.
(340) Schreinemakers, *7*, **69**: 557; 09. (341) Schreinemakers, *176*, **7**: 197; 10. (341.5) Schreinemakers, *176*, **7**: 333; 10. (342) Schreinemakers, *18*, **15**: 80; 10. (343) Schreinemakers, *7*, **71**: 109; 10. (344) Schreinemakers, *18*, **15**: 396; 11. (345) Schreinemakers, *64P*, **13**: 1163; 11. (346) Schreinemakers, *64P*, **15**: 1313; 13. (347) Schreinemakers and de Baat, *7*, **65**: 586; 09. (348) Schreinemakers and de Baat, *176*, **7**: 259, 10. (349) Schreinemakers and de Baat, *64P*, **17**: 533; 14.
(350) Schreinemakers and de Baat, *64P*, **17**: 781; 14. (351) Schreinemakers and de Baat, *64P*, **17**: 2, 1111; 15. (352) Schreinemakers and de Baat, *64P*, **18**: 126; 15. (353) Schreinemakers and de Baat, *176*, **14**: 141; 17. (354) Schreinemakers and de Baat, *176*, **14**: 262; 17. (355) Schreinemakers and de Baat, *70*, **39**: 423; 20. (356) Schreinemakers, Berkhoff and Posthumus, *70*, **43**: 508; 24. (357) Schreinemakers and Kayser, *176*, **15**: 120; 18. (358) Schreinemakers and Noorduyn, *176*, **15**: 118; 18. (359) Schreinemakers and Thonus, *64P*, **15**: 472; 12.
(360) Schurmann, *1*, **46**: 1444; 24. (361) Seidell and Smith, *50*, **8**: 493; 04. (361.5) Sidgwick and Lewis, *4*, **1926**: 1287. (362) Smith, *1*, **42**: 259; 20. (363) Smith, *1*, **45**: 360; 23. (364) Smits, Elgersma and Hardenberg, *70*, **43**: 671; 24. (365) Spencer, *4*, **107**: 1265; 15. (366) Stortenbeker, *7*, **16**: 250; 95. (367) Stortenbeker, *7*, **22**: 60; 97. (368) Stortenbeker, *7*, **34**: 108; 00. (369) Stortenbeker, *70*, **21**: 399; 02.
(370) Straub, *7*, **77**: 331; 11. (371) Sudhaus, *190B*, **37**: 1; 14. (372) Süss, *94*, **51**: 240; 12. (373) Sullivan, *1*, **27**: 529; 05. (374) Taber, *50*, **10**: 626; 06 (375) Takegami, *429*, **4**: 317; 21. (376) Takegami, *429*, **5**: 194; 22. (377) Takeuchi, *429*, **1**: 249; 16. (378) Terres and Weiser, *9*, **27**: 177; 21. (379) Terrey and Jolly, *4*, **123**: 2217; 23.
(380) Thin and Cummings, *4*, **107**: 361; 15. (381) Tilden and Shenstone, *5*, **38**: 331; 85. (382) Toda, *429*, **4**: 305; 21. (383) Toda, *429*, **4**: 377; 21. (384) Toperescu, *34*, **174**: 870; 22. **175**: 268; 22. (385) Trifanov, *Ann. scient. univ. Saratov*, **1**: 10; 23. (386) Trimble, *1*, **44**: 451; 22. (387) Uyeda, *172*, **8 XXII**: 235; 12. (388) Valeton and Frömel, *93*, **137**: 91; 24. (389) Van Name and Bothworth, *93*, **67**: 97; 10.
(390) de Waal, *Diss.*, Leiden, 1910. (391) Wales, *45*, **14**: 317; 22. (392) Walker and Fyffe, *4*, **83**: 173; 03. (393) Weston, *4*, **121**: 1223; 22. (394) Wirth, *93*, **58**: 213; 08. (395) Wirth, *93*, **76**: 174; 12. (396) Wirth, *93*, **79**: 360; 12. (397) Wirth, *93*, **87**: 1; 14. (398) Wirth, *93*, **87**: 9; 14. (399) Wirth and Bakke, *93*, **87**: 13; 14.
(400) Wirth and Bakke, *93*, **87**: 47; 14. (400.5) Wöhler and Schäfter, *93*, **149**: 389; 25. (401) Wood, *4*, **97**: 878; 10. (401.1) Zambonini and Restaino, *22*, **3**: 178; 26 (401.2) Zambonini and Restaino, *22*, **4**: 5; 26. (401.5) Zambonini and Restaino, *22*, **4**: 175; 26. (402) Zhemchuzhnui and Rambach, *93*, **65**: 403; 10. (403) Zweiglówna, *Rocznìki Chemji, Varsovie*, **4**: 331; 24. (404) Hill and Hill, *1*, **49**: 967; 27. (405) Farrow, *4*, **1927**: 1153. (406) Foote, *12*, **13**: 158; 27. (407) Jänecke, Eissner and Brill, *93*, **160**: 171; 27. (408) Malquori, *22*, **5**: 451; 27. (409) Malquori, *22*, **5**: 510; 27.
(410) Malquori, *22*, **5**: 576; 27. (411) Müller, Müller and Fauvel, *9*, **33**: 134; 27. (412) Blasdale, *Equilibrium in Saturated Salt Solutions*. The Chemical Catalog Co., New York, 1927.

# FREEZING-POINT—SOLUBILITY DATA FOR THREE-COMPONENT AQUEOUS SYSTEMS IN WHICH AT LEAST ONE OF THE TWO NON-AQUEOUS COMPONENTS IS EITHER A WEAK ELECTROLYTE OR AN ORGANIC ACID, BASE, OR NON-ELECTROLYTE

Alexander Findlay and William Thomas

*Arrangement.*—In the following tables, the A-component is always water. The systems are arranged in the order of their B-components according to the standard arrangement (*v.* Vol. III, p. viii), except that B-compounds whose key-formulae begin with 16 follow one another in the ℭ-arrangement. Under each B-component, the C-components follow the above described arrangement of B-components. For abbreviations, *v.* p. 4.

*Arrangement.*—Dans les tables suivantes, le constituant A est toujours l'eau. Les systèmes sont disposés dans l'ordre de leurs constituants B suivant l'arrangement type (*v.* Vol. III, p. viii), excepté pour les composés B dont la formule clé commence par 16, qui se suivent suivant l'arrangement ℭ. Sous chaque constituant B, les constituants C suivent l'arrangement décrit ci-dessus pour les constituants B. Pour les abréviations, *v.* p. 4.

*Anordnung.*—In den folgenden Tafeln ist die A-Komponente immer Wasser. Die Systeme sind in der Reihenfolge ihrer B-Komponenten nach der Standardanordnung, (*siehe* Bd. III, S. viii) gereiht, ausgenommen bei denjenigen Kohlenstoffverbindungen, deren Schlüsselformel mit 16 beginnt, folgen diese aufeinander in der ℭ-Anordnung. Unter jeder B-Komponente folgt die C-Komponente in der oben angegebenen Anordnung der B-Komponente. Für Abkürzungen, *siehe* S. 4.

*Ordine di disposizione.*—Nelle tabelle seguenti il componente A è sempre l'acqua. I sistemi sono disposti secondo i componenti B nell'ordine standard di disposizione (*v.* Vol. III, p. viii). Sono eccettuati i composti la cui formula chiave comincia con 16, i quali si seguono secondo l'ordinamento ℭ. Sotto ciascun componente B, i componenti C seguono la disposizione sopra indicata dei componenti B. Per abbreviazioni, *v.* p. 4.

$t$ = temp., °C

## HCl

C = $C_2H_2O_4$, Oxalic acid; $t$ = 30.0° (92)

| $d_{30}^{30}$ soln. | Mol/l soln. | | | $d_{30}^{30}$ soln. | Mol/l soln. | | |
|---|---|---|---|---|---|---|---|
| | B | C | A | | B | C | A |
| | $C_2H_2O_4.2H_2O$ | | | | | | |
| 1.059 | 0 | 1.479 | 51.15 | 1.096 | 4.528 | 0.555 | 48.33 |
| 1.056 | 0.503 | 1.190 | 51.62 | 1.117 | 6.026 | 0.525 | 46.89 |
| 1.058 | 0.970 | 1.032 | 51.34 | 1.149 | 7.907 | 0.607 | 44.49 |
| 1.065 | 1.939 | 0.821 | 50.83 | 1.184 | 9.68 | 0.871 | 41.52 |
| 1.076 | 2.959 | 0.675 | 50.10 | | | | |

C = $C_3H_3Cl_3O_3$, Trichlorolactic acid; $t$ = 25° (80)

| Mol/l soln. | | Mol/l soln. | |
|---|---|---|---|
| B | C | B | C |
| $C_3H_3Cl_3O_3$ | | | |
| 1.234 | 2.545 | 8.959 | 0.624 |
| 2.837 | 1.425 | 10.65 | 0.57 |
| 4.388 | 0.984 | 11.86 | 0.57 |
| 5.982 | 0.760 | 12.17 | 0.60 |
| 7.675 | 0.659 | | |

**HCl.—(*Continued*)**

C = $C_3H_4O_4$
Malonic acid
$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_3H_4O_4$ | |
| 4.443 | 3.85 |
| 6.210 | 3.00 |
| 8.658 | 2.36 |
| 10.47 | 2.16 |
| 11.09 | 2.13 |
| 11.22 | 2.15 |

C = $C_4H_6O_4$
Succinic acid
$t$ = 25°
$C_4H_6O_4$ (56)

| | |
|---|---|
| 4.57 | 0.235 |
| 3.51 | 0.273 |
| 2.41 | 0.30 |
| 1.25 | 0.430 |
| 0.506 | 0.561 |
| 0 | 0.672 |
| (80) | |
| 2.751 | 0.341 |
| 5.964 | 0.201 |
| 7.335 | 0.177 |
| 8.950 | 0.167 |
| 9.732 | 0.164 |
| 10.40 | 0.169 |
| 11.98 | 0.189 |

C = $C_4H_6O_6$
Tartaric acid
$t$ = 25° (80)
$C_4H_6O_6$

| | |
|---|---|
| 1.257 | 4.264 |
| 2.568 | 3.546 |
| 4.466 | 2.717 |
| 6.303 | 2.18 |
| 8.144 | 1.89 |
| 9.890 | 1.72 |
| 10.51 | 1.71 |
| 11.17 | 1.71 |

C = $C_6H_3N_3O_7$
Picric acid
$t$ = 25° (130)
Mol/100 cm³ soln.

| B | C |
|---|---|
| $C_6H_3N_3O_7$ | |
| 0.025 | 0.00116 |
| 0.050 | 0.00079 |
| 0.075 | 0.00062 |
| 0.100 | 0.00054 |
| 0.146 | 0.00050 |
| 0.2202 | 0.00051 |
| 0.2936 | 0.00057 |
| 0.367 | 0.00068 |
| 0.4404 | 0.00082 |
| 0.5138 | 0.00098 |
| 0.5505 | 0.00105 |
| 0.5872 | 0.00115 |
| 0.6239 | 0.00123 |
| 0.6606 | 0.00125 |

C = $C_6H_3N_3O_8$
Styphnic acid
$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_6H_3N_3O_8$ | |
| 1.410 | 0.00031 |
| 2.814 | 0.00030 |
| 4.221 | 0.00036 |
| 5.634 | 0.00047 |
| 6.997 | 0.00082 |
| 8.418 | 0.00099 |
| 11.10 | 0.00190 |
| 11.16 | 0.00194 |

C = $C_6H_4O_2$
Quinone
$t$ = 25° (47)

| Mol B/l (A + B) | Mol C/l soln. |
|---|---|
| $C_6H_4O_2$ | |
| 0 | 0.1266 |
| 0.1 | 0.1275 |
| 1.0 | 0.1332 |

C = $C_6H_5NO_3$
*m*-Nitrophenol
$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_6H_5NO_3$ | |
| 1.925 | 0.0849 |
| 3.822 | 0.0834 |
| 5.720 | 0.0885 |
| 7.550 | 0.1009 |
| 9.213 | 0.1130 |
| 10.96 | 0.1284 |
| 11.20 | 0.1307 |

C = $C_6H_5NO_3$
*p*-Nitrophenol
$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_6H_5NO_3$ | |
| 1.650 | 0.0962 |
| 3.277 | 0.0912 |
| 4.993 | 0.0934 |
| 6.552 | 0.0990 |
| 8.196 | 0.1093 |
| 9.817 | 0.1230 |
| 11.29 | 0.1421 |

C = $C_6H_6O$
Phenol
$t$ = 12° (122)
Wt. % soln.

| B | C |
|---|---|
| $C_6H_6O$ | |
| 0 | 88.78 |
| 0.52 | 84.5* |
| 10.7 | 4.8* |
| 15.64 | 3.98 |
| 24.37 | 3.2 |
| 36.25 | 3.5 |

* Two liquid phases.

C = $C_6H_6O_2$
Catechol
$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_6H_6O_2$ | |
| 1.68 | 1.07 |
| 3.53 | 0.59 |
| 5.39 | 0.41 |
| 7.30 | 0.31 |
| 9.11 | 0.28 |
| 10.83 | 0.28 |

C = $C_6H_6O_2$
Resorcinol
$t$ = 25° (80)
$C_6H_6O_2$

| | |
|---|---|
| 0.656 | 2.853 |
| 1.671 | 2.285 |
| 3.410 | 1.510 |
| 4.402 | 1.154 |
| 6.076 | 0.808 |
| 7.567 | 0.644 |
| 9.157 | 0.563 |
| 9.610 | 0.559 |
| 11.31 | 0.695 |

C = $C_6H_6O_2$
Hydroquinol
$t$ = 25° (47)

| Mol B/l (A + B) | Mol C/l soln. |
|---|---|
| $C_6H_6O_2$ | |
| 0 | 0.645 |
| 0.01 | 0.645 |
| 0.1 | 0.633 |
| 1.0 | 0.494 |

$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_6H_6O_2$ | |
| 1.892 | 0.201 |
| 3.793 | 0.141 |
| 5.729 | 0.108 |
| 7.597 | 0.094 |
| 9.237 | 0.089 |
| 10.97 | 0.083 |

C = $C_6H_6O_3$
Pyrogallol
$t$ = 25° (80)
$C_6H_6O_3$

| | |
|---|---|
| 1.53 | 0.94 |
| 3.18 | 0.62 |
| 5.12 | 0.42 |
| 6.86 | 0.34 |
| 8.68 | 0.30 |
| 10.43 | 0.31 |
| 10.48 | 0.31 |

C = $C_6H_8O_7$
Citric acid
$t$ = 25° (80)
$C_6H_8O_7$

| | |
|---|---|
| 0.949 | 3.68 |
| 2.189 | 3.10 |
| 3.795 | 2.45 |
| 5.718 | 1.79 |

**C = $C_6H_8O_7$.—(*Continued*)**
Mol/l soln.

| B | C |
|---|---|
| $C_6H_8O_7$ | |
| 7.736 | 1.36 |
| 9.635 | 1.15 |
| 10.36 | 1.12 |
| 11.09 | 1.10 |

C = $C_7H_4N_2O_6$
3, 5-Dinitrobenzoic acid
$t$ = 25° (80)
$C_7H_4N_2O_6$

| | |
|---|---|
| 1.565 | 0.00398 |
| 2.908 | 0.00470 |
| 4.594 | 0.00583 |
| 5.657 | 0.00690 |
| 7.336 | 0.00841 |
| 8.855 | 0.00965 |
| 10.27 | 0.01095 |
| 11.73 | 0.01240 |

C = $C_7H_5NO_4$
*o*-Nitrobenzoic acid
$t$ = 25° (74)

| Mol B/l (A + B) | Mol C/l soln. |
|---|---|
| $C_7H_5NO_4$ | |
| 0 | 0.0434 |
| 0.0179 | 0.0368 |
| 0.0357 | 0.0339 |
| 0.125 | 0.0298 |
| 0.25 | 0.0292 |
| 0.5 | 0.0285 |

$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_7H_5NO_4$ | |
| 1.314 | 0.0280 |
| 2.607 | 0.0256 |
| 3.909 | 0.0239 |
| 5.013 | 0.0235 |
| 6.509 | 0.0233 |
| 7.795 | 0.0237 |
| 9.080 | 0.0250 |
| 10.30 | 0.0267 |

C = $C_7H_5NO_4$
*m*-Nitrobenzoic acid
$t$ = 25° (80)
$C_7H_5NO_4$

| | |
|---|---|
| 1.416 | 0.0175 |
| 3.310 | 0.0178 |
| 4.308 | 0.0183 |
| 5.593 | 0.0205 |
| 7.044 | 0.0225 |
| 8.380 | 0.0256 |
| 9.793 | 0.0293 |
| 11.54 | 0.0368 |

C = $C_7H_5N_3O_7$
Methylpicric acid
$t$ = 25° (74)

| Mol B/l (A + B) | Mol C/l soln. |
|---|---|
| $C_7H_5N_3O_7$ | |
| 0.00895 | 0.00641 |
| 0.01593 | 0.00487 |

C = $C_7H_6O_2$
Benzoic acid
$t$ = 25° (75)

| Mol B/l (A + B) | Mol C/l soln. |
|---|---|
| $C_7H_6O_2$ | |
| 0.0 | 0.0276 |
| 0.2828 | 0.0254 |
| 0.6308 | 0.0235 |
| 1.180 | 0.0211 |
| 1.848 | 0.0185 |
| 3.308 | 0.0153 |
| 4.410 | 0.0140 |
| 5.238 | 0.0130 |
| 7.172 | 0.0113 |
| 9.522 | 0.0109 |

C = $C_7H_6O_3$
Salicylic acid
$t$ = 25°
$C_7H_6O_3$ (74)

| | |
|---|---|
| 0 | 0.01634 |
| 0.0179 | 0.01290 |
| 0.0357 | 0.01238 |
| 0.125 | 0.01214 |
| 0.25 | 0.01194 |
| 0.5 | 0.01123 |
| (75) | |
| 0 | 0.0162 |
| 0.500 | 0.0112 |
| 1.180 | 0.0101 |
| 1.848 | 0.00912 |
| 2.498 | 0.00834 |
| 3.308 | 0.00777 |
| 4.410 | 0.00732 |
| 7.172 | 0.00695 |
| 9.552 | 0.00721 |
| 11.73 | 0.00768 |

Mol/l soln. (80)

| B | C |
|---|---|
| $C_7H_6O_3$ | |
| 1.46 | 0.00982 |
| 3.06 | 0.00822 |
| 4.37 | 0.00715 |
| 6.16 | 0.00654 |
| 7.31 | 0.00656 |
| 8.73 | 0.00666 |
| 10.2 | 0.00710 |
| 11.5 | 0.00794 |
| 12.2 | 0.00856 |

C = $C_8H_6O_4$
Phthalic acid
$t$ = 25° (80)
$C_8H_6O_4$

| | |
|---|---|
| 1.729 | 0.0211 |
| 3.113 | 0.0149 |
| 4.693 | 0.0108 |
| 6.100 | 0.0086 |
| 7.603 | 0.00675 |
| 9.150 | 0.0060 |
| 10.63 | 0.0064 |
| 12.05 | 0.00685 |

C = $C_8H_6O_4$.—(*Continued*)
$t$ = 25.00° (108)

| Mol B/l (A + B) | $C_7$* Rel. solubility |
|---|---|
| $C_8H_6O_4$ | |
| 0.217 | 0.768 |
| 0.639 | 0.697 |
| 1.175 | 0.620 |
| 1.915 | 0.494 |
| 1.936 | 0.486 |

* Unit of solubility is that in pure $H_2O$, which = 0.04185 g-Mol/l; ($d_4^{25}$ = 1.0022).

C = $C_8H_8O_2$
Phenylacetic acid
$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_8H_8O_2$ | |
| 1.417 | 0.0984 |
| 2.890 | 0.0833 |
| 4.313 | 0.0763 |
| 5.770 | 0.0739 |
| 7.175 | 0.0756 |
| 8.590 | 0.0815 |
| 9.888 | 0.0916 |
| 11.36 | 0.1099 |

C = $C_8H_8O_3$
Mandelic acid
$t$ = 25° (80)
$C_8H_8O_3$

| | |
|---|---|
| 1.202 | 0.691 |
| 2.48 | 0.488 |
| 3.75 | 0.387 |
| 5.02 | 0.332 |
| 6.27 | 0.307 |
| 7.52 | 0.302 |
| 8.75 | 0.316 |
| 9.94 | 0.353 |
| 10.35 | 0.375 |

C = $C_8H_{14}O_4$
Suberic acid
$t$ = 25° (80)
$C_8H_{14}O_4$

| | |
|---|---|
| 1.423 | 0.0249 |
| 2.858 | 0.0214 |
| 4.281 | 0.0206 |
| 5.691 | 0.0216 |
| 7.130 | 0.0252 |
| 8.278 | 0.0317 |
| 9.865 | 0.0453 |
| 11.20 | 0.0685 |

C = $C_9H_8O_2$
Cinnamic acid
$t$ = 25° (80)
$C_9H_8O_2$

| | |
|---|---|
| 2.100 | 0.00283 |
| 4.174 | 0.00272 |
| 6.250 | 0.00318 |
| 8.007 | 0.00400 |
| 10.29 | 0.00556 |
| 10.47 | 0.00572 |

C = $C_{10}H_8O$
Naphthol
$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_{10}H_8O$ | |
| 1.466 | 0.00410 |
| 2.952 | 0.00360 |
| 4.343 | 0.00333 |
| 5.785 | 0.00319 |
| 7.122 | 0.00316 |
| 8.674 | 0.00307 |
| 11.47 | 0.00341 |

C = $C_{10}H_8SO_3$
β-Naphthalenesulfonic acid
$t$ = 30.1° (92)

| $d_{30}^{30}$ soln. | Mol/l soln. B | C | A |
|---|---|---|---|
| | $C_{10}H_8SO_3.2H_2O$ | | |
| 1.1925 | 0 | 3.263 | 28.20 |
| 1.1653 | 1.291 | 2.470 | 33.25 |
| 1.1553 | 1.826 | 2.117 | 35.69 |
| 1.1115 | 4.017 | 0.762 | 44.49 |
| 1.1197 | 7.232 | 0.089 | 46.21 |
| 1.1569 | 9.88 | 0.063 | 43.21 |

C = $C_{10}H_{14}O$ (125)
Thymol

| Mol B/l (A + B) | g C/l soln. 25° | 37.5° |
|---|---|---|
| $C_{10}H_{14}O$ | | |
| 0.0 | 0.995 | 1.32 |
| 0.1 | 0.968 | 1.29 |
| 0.5 | 0.884 | 1.21 |
| 1.0 | 0.802 | 1.12 |
| 2.5 | 0.612 | 0.935 |
| 5.0 | 0.445 | 0.772 |

C = $C_{12}H_{10}O_4$
Quinhydrone
$t$ = 25° (47)

| Mol B/l (A + B) | Mol C/l soln. |
|---|---|
| $C_{12}H_{10}O_4$ | |
| 0 | 0.0178 |
| 0.1 | 0.0173 |
| 1.0 | 0.0162 |

C = $C_{12}H_{11}N$
Diphenylamine
$t$ = 25° (36)
$C_{12}H_{11}N$

| | |
|---|---|
| 0 | 0.000277 |
| 0.211 | 0.000507 |

C = $C_{14}H_8O_2$
Phenanthraquinone
$t$ = 25° (80.1)

| Mol B/l soln. | g C/l soln. |
|---|---|
| $C_{14}H_8O_2$ | |
| 3.11 | 0.012 |
| 4.25 | 0.016 |
| 5.12 | 0.023 |
| 6.05 | 0.029 |
| 7.20 | 0.046 |

C = $C_{14}H_8O_2$.—(*Continued*)

| Mol B/l soln. | g C/l soln. |
|---|---|
| $C_{14}H_8O_2$ | |
| 8.50 | 0.058 |
| 9.25 | 0.088 |
| 10.8 | 0.157 |

C = $C_{14}H_{10}O_3$
Diphenyleneglycolic acid
$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_{14}H_{10}O_3$ | |
| 1.952 | 0.00492 |
| 3.907 | 0.00355 |
| 5.843 | 0.00343 |
| 7.745 | 0.00352 |

C = $C_{14}H_{10}O_4$
Diphenic acid
$t$ = 25° (80)
$C_{14}H_{10}O_4$

| | |
|---|---|
| 2.103 | 0.00091 |
| 3.985 | 0.00072 |
| 5.928 | 0.00056 |
| 7.748 | 0.00059 |

C = $C_{14}H_{12}O_2$
Diphenylacetic acid
$t$ = 25° (80)
$C_{14}H_{12}O_2$

| | |
|---|---|
| 1.620 | 0.00047 |
| 2.913 | 0.00040 |
| 4.512 | 0.00036 |
| 5.973 | 0.00038 |
| 7.349 | 0.00041 |
| 8.889 | 0.00042 |
| 10.27 | 0.00046 |
| 11.74 | 0.00053 |

C = $C_{14}H_{12}O_3$
Benzilic acid
$t$ =25° (80)
$C_{14}H_{12}O_3$

| | |
|---|---|
| 1.537 | 0.00332 |
| 2.977 | 0.00233 |
| 4.440 | 0.00182 |
| 5.934 | 0.00172 |
| 7.356 | 0.00150 |
| 8.803 | 0.00167 |
| 10.25 | 0.00195 |
| 11.69 | 0.00217 |

C = $C_{24}H_{19}NO_3S$
Triphenylsulfanilic acid (73)

HBr
C = $C_4H_6O_4$
Succinic acid
$t$ = 25° (56)
Mol/l soln.

| B | C |
|---|---|
| $C_4H_6O_4$ | |
| 0 | 0.672 |
| 0.98 | 0.486 |
| 3.39 | 0.278 |

## $I_2$

C = $C_3H_8O_3$
Glycerol; *v. also* p. 266
$t$ = 25° (58)

| g B/kg (A + B) | Wt. % C in (A + B) |
|---|---|
| $I_2$ | |
| 9.68 | 100 |
| 6.1 | 90 |
| 3.8 | 80 |
| 2.3 | 70 |
| 1.7 | 60 |
| 1.2 | 50 |
| 0.79 | 40 |
| 0.3 | 0 |

## $H_2S$

C = CaS
$t$ = 20° (106)
g/l soln.

| B | C |
|---|---|
| CaS | |
| 1.091 | 2.673 |
| 1.504 | 3.303 |
| 3.007 | 3.974 |

## $H_2SO_4$

C = $CH_4N_4O_2$ (27)
Nitroguanidine

| Vol. % B in (A+B) | g C/l soln. 0° | g C/l soln. 25° |
|---|---|---|
| $CH_4N_4O_2$ | | |
| 45 | 58 | 109 |
| 40 | 34 | 80 |
| 35 | 20 | 52 |
| 30 | 13 | 29 |
| 25 | 7.5 | 18 |
| 20 | 4.5 | 10.5 |
| 15 | 3.0 | 5.5 |
| 0 | 1.2 | 4.2 |

$t$ = 13° (34)

| Wt. % B in (A + B) | g C/kg (A + B) |
|---|---|
| $CH_4N_4O_2$ | |
| 33.2 | 25.5 |
| 28.2 | 13.7 |
| 25.2 | 9.5 |
| 22.7 | 8.7 |
| 20.0 | 7.2 |
| 17.2 | 6.5 |
| 5.8 | 3.7 |

C = $C_2H_2O_4$
Oxalic acid
$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_2H_2O_4$ | |
| 1.094 | 0.760 |
| 2.262 | 0.529 |
| 3.418 | 0.396 |
| 4.613 | 0.338 |
| 5.725 | 0.346 |
| 6.815 | 0.415 |
| 7.785 | 0.579 |
| 8.575 | 0.902 |

C = $C_3H_3Cl_3O_3$
Trichlorolactic acid
$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_3H_3Cl_3O_3$ | |
| 1.263 | 1.896 |
| 3.083 | 0.671 |
| 4.794 | 0.353 |
| 6.375 | 0.26 |
| 8.14 | 0.15 |
| 9.69 | 0.18 |
| 11.14 | 0.21 |
| 12.69 | 0.26 |

C = $C_3H_4O_4$
Malonic acid
$t$ = 25° (80)

| $C_3H_4O_4$ | |
|---|---|
| 1.364 | 5.72 |
| 3.525 | 3.40 |
| 5.88 | 2.04 |
| 8.03 | 1.51 |
| 9.96 | 1.60 |
| 10.92 | 2.28 |

C = $C_4H_6O_4$
Succinic acid
$t$ = 25° (80)

| $C_4H_6O_4$ | |
|---|---|
| 0.99 | 0.454 |
| 1.91 | 0.342 |
| 2.47 | 0.282 |
| 4.06 | 0.194 |
| 5.1 | 0.17 |
| 6.9 | 0.15 |
| 8.6 | 0.15 |
| 10.2 | 0.20 |
| 11.6 | 0.35 |

C = $C_4H_6O_6$
Tartaric acid
$t$ = 25° (80)

| $C_4H_6O_6$ | |
|---|---|
| 0.90 | 4.26 |
| 2.02 | 3.32 |
| 3.40 | 2.37 |
| 4.95 | 1.59 |
| 6.27 | 1.22 |
| 7.73 | 0.975 |
| 9.05 | 0.885 |
| 9.93 | 0.93 |
| 11.1 | 1.37 |

C = $C_6H_4N_2O_4$
Dinitrobenzene (66)
Diagrams given

C = $C_6H_8O_7$
Citric acid
$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_6H_8O_7$ | |
| 0.84 | 3.52 |
| 2.10 | 2.66 |
| 3.57 | 1.87 |
| 5.42 | 1.09 |
| 5.73 | 1.02 |
| 7.12 | 0.74 |

C = $C_6H_8O_7$.—*(Continued)*
Mol/l soln.

| B | C |
|---|---|
| $C_6H_8O_7$ | |
| 9.09 | 0.59 |
| 10.29 | 0.67 |
| 11.18 | 0.96 |

C = $C_7H_5N_3O_6$
Trinitrotoluene (66)
Diagrams given

C = $C_8H_8O_3$
Mandelic acid
$t$ = 25° (80)

| $C_8H_8O_3$ | |
|---|---|
| 1.348 | 0.484 |
| 2.695 | 0.278 |
| 4.147 | 0.186 |
| 5.53 | 0.18 |
| 6.81 | 0.18 |
| 8.25 | 0.16 |
| 9.45 | 0.23 |
| 10.58 | 0.27 |

C = $C_8H_{10}N_4O_2$
Caffeine
$t$ = 25° (33)

| Mol B/l (A + B) | g C/l soln. |
|---|---|
| $C_8H_{10}N_4O_2$ | |
| 0.5 | 33.61 |
| 0.5 | 33.51 |

C = $C_8H_{14}O_4$
Suberic acid
$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_8H_{14}O_4$ | |
| 0.929 | 0.02 |
| 2.617 | 0.019 |
| 3.767 | 0.021 |
| 5.67 | 0.03 |
| 9.33 | 0.010 |

C = $C_{14}H_8O_2$
Phenanthraquinone
$t$ = 25° (80.1)

| Mol B/l soln. | g C/l soln. |
|---|---|
| $C_{14}H_8O_2$ | |
| 2.98 | 0.008 |
| 3.50 | 0.0095 |
| 4.74 | 0.012 |
| 5.8 | 0.019 |
| 6.8 | 0.030 |
| 7.6 | 0.043 |
| 8.6 | 0.082 |
| 9.3 | 0.116 |

## $HNO_3$

C = $CH_4N_4O_2$
Nitroguanidine
$t$ = 13° (34)

| Wt. % B in (A + B) | g C/kg (A + B) |
|---|---|
| $CH_4N_4O_2$ | |
| 27 | 23.0 |
| 23 | 14.7 |
| 19 | 9.7 |
| 15.5 | 8.2 |
| 6.4 | 4.7 |

C = $C_2H_2O_4$
Oxalic acid
$t$ = 30.0° (92)
Mol/l soln.

| B | C | A |
|---|---|---|
| $C_2H_2O_4.2H_2O$ | | |
| 0 | 1.479 | 51.15 |
| 0.478 | 1.268 | 50.84 |
| 1.606 | 1.039 | 49.60 |
| 2.453 | 0.933 | 48.50 |
| 4.224 | 0.790 | 45.74 |
| 7.600 | 0.661 | 39.63 |
| 9.59 | 0.639 | 35.51 |
| 11.84 | 0.696 | 30.17 |
| 13.62 | 0.847 | 25.15 |
| 14.12 | 0.966 | 23.48 |
| $C_2H_2O_4$* | | |
| 15.59 | 1.114 | 19.03 |
| 16.92 | 0.840 | 16.42 |
| 20.84 | 0.524 | 6.38 |
| 21.23 | 0.531 | 5.20 |
| 21.57 | 0.548 | 4.07 |
| 21.63 | 0.553 | 4.01 |

* Solubility curves of $C_2H_2O_4$ and $C_2H_2O_4.2H_2O$ intersect at *ca.* B = 14.8.

C = $C_4H_6O_4$
Succinic acid
$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_4H_6O_4$ | |
| 1.299 | 0.567 |
| 3.034 | 0.471 |
| 5.236 | 0.362 |
| 6.616 | 0.326 |
| 9.710 | 0.264 |
| 11.11 | 0.259 |
| 13.51 | 0.281 |
| 15.43 | 0.366 |

C = $C_6H_3N_3O_7$
Picric acid
$t$ = 25° (80)

| $C_6H_3N_3O_7$ | |
|---|---|
| 1.022 | 0.0108 |
| 2.059 | 0.0124 |
| 4.161 | 0.0237 |
| 6.289 | 0.0405 |
| 8.334 | 0.0612 |
| 10.47 | 0.1006 |
| 12.47 | 0.1763 |
| 14.29 | 0.3533 |

C = $C_6H_3N_3O_8$, Styphnic acid
$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_6H_3N_3O_8$ | |
| 1.785 | 0.000702 |
| 4.171 | 0.00109 |
| 6.234 | 0.001637 |
| 8.368 | 0.002554 |
| 10.31 | 0.00397 |
| 11.97 | 0.00649 |
| 13.97 | 0.01371 |
| 15.57 | 0.02806 |

C = $C_7H_6O_2$, Benzoic acid
$t$ = 25° (75)

| $C_7H_6O_2$ | |
|---|---|
| 0.0 | 0.0276 |
| 0.0208 | 0.0272 |
| 0.0807 | 0.0269 |
| 0.1351 | 0.0268 |
| 0.2021 | 0.0268 |
| 0.5514 | 0.0270 |
| 1.019 | 0.0271 |
| 1.623 | 0.0272 |
| 2.430 | 0.0275 |
| 3.883 | 0.0277 |
| 4.784 | 0.0284 |

C = $C_7H_6O_3$
Salicylic acid
$t$ = 25° (75)

| $C_7H_6O_3$ | |
|---|---|
| 0.0 | 0.0162 |
| 0.0109 | 0.0149 |
| 0.0420 | 0.0140 |
| 0.0807 | 0.0139 |
| 0.2408 | 0.0141 |
| 0.5514 | 0.0150 |
| 1.019 | 0.0184 |

C = $C_8H_6O_4$
Phthalic acid
$t$ = 25° (80)

| $C_8H_6O_4$ | |
|---|---|
| 2.08 | 0.0291 |
| 4.08 | 0.0235 |
| 6.72 | 0.0188 |
| 9.04 | 0.0166 |
| 10.40 | 0.0163 |
| 12.60 | 0.0175 |
| 14.42 | 0.0210 |
| 15.99 | 0.0289 |

C = $C_8H_{14}O_4$, Suberic acid
$t$ = 25° (80)

| $C_8H_{14}O_4$ | |
|---|---|
| 0.307 | 0.0297 |
| 0.555 | 0.0295 |
| 0.906 | 0.0317 |
| 1.543 | 0.0348 |
| 2.021 | 0.0420 |
| 4.035 | 0.0500 |
| 5.749 | 0.0567 |
| 8.091 | 0.0788 |
| 10.05 | 0.1116 |
| 11.77 | 0.1948 |
| 13.30 | 0.3025 |

C = $C_{14}H_8O_2$
Phenanthraquinone
$t$ = 25° (80.1)

| Mol B/l (A + B) | g C/l soln. |
|---|---|
| $C_{14}H_8O_2$ | |
| 4.26 | 0.049 |
| 4.54 | 0.053 |
| 5.02 | 0.067 |
| 6.15 | 0.099 |
| 6.70 | 0.118 |
| 7.20 | 0.157 |
| 7.45 | 0.175 |
| 8.30 | 0.227 |

## $NH_3$

C = $As_2O_3$
$t$ = 25° (120)
Wt. % soln.

| B | C |
|---|---|
| $As_2O_3$ | |
| 0 | 2.26 |
| 1.41 | 10.98 |
| 2.78 | 20.49 |
| 2.86 | 21.17 |
| $NH_4AsO_2$ | |
| 2.88 | 18.43 |
| 3.13 | 12.30 |
| 3.18 | 11.13 |
| 3.91 | 7.63 |
| 5.82 | 5.61 |
| 6.95 | 4.72 |
| 9.25 | 3.44 |
| 9.93 | 3.20 |
| 10.06 | 3.14 |
| 13.98 | 2.50 |
| 14.28 | 2.16 |

C = $C_4H_{12}IN$
Tetramethylammonium iodide
$t$ = 25° (61)

| Mol B/l (A + B) | g C/l soln. |
|---|---|
| $C_4H_{12}IN$ | |
| 0.0 | 52.76 |
| 0.049 | 52.71 |
| 0.100 | 52.86 |
| 0.210 | 52.62 |
| 0.522 | 52.58 |
| 1.015 | 52.38 |
| 2.110 | 52.03 |

C = $C_{17}H_{19}NO_3$ (51)
Morphine

| Mol B/l (A + B) | g C/l (A + B) 18° | 25° |
|---|---|---|
| $C_{17}H_{19}NO_3$ | | |
| 0.1 | 0.876 | 0.974 |
| 0.2 | 1.226 | 1.238 |
| 0.588 | 2.478 | 2.548 |
| 1.0 | 3.086 | 3.242 |
| 2.941 | 4.316 | 4.404 |
| 5.88 | 6.380 | 7.100 |

C = $C_{19}H_{22}N_2O$
Cinchonine
$t$ = 20° (114)

| Wt. % B in (A + B) | g C/kg (A + B) |
|---|---|
| $C_{19}H_{22}N_2O$ | |
| 0.0 | 1.30 |
| 10 | 4.13 |

C = $C_{21}H_{22}N_2O_2$
Strychnine
$t$ = 20° (114)

| $C_{21}H_{22}N_2O_2$ | |
|---|---|
| 0.0 | 0.39 |
| 10 | 2.57 |

C = $Hg(CN)_2$
$t$ = 0° (14)
Wt. % soln.

| B | C |
|---|---|
| $Hg(CN)_2$ | |
| 0.0 | 6.31 |
| 0.43 | 8.46 |
| $Hg(CN)_2 + Hg(CN)_2.NH_3$ | |
| 1.08 | 11.68 |
| $Hg(CN)_2.NH_3$ | |
| 2.06 | 9.40 |
| 2.74 | 9.44 |
| 4.08 | 10.32 |
| 6.82 | 15.43 |
| 7.67 | 17.51 |
| 8.25 | 19.31 |
| 9.40 | 24.68 |
| $Hg(CN)_2.NH_3 + Hg(CN)_2.2NH_3$ | |
| 9.52 | 25.45 |
| $Hg(CN)_2.2NH_3$ | |
| 11.23 | 24.04 |
| 12.59 | 23.40 |
| 16.87 | 24.46 |
| 22.09 | 43.57 |
| 21.51 | 66.10 |
| 29.70* | 79.30* |

* Extrapolated.

C = $Al(OH)_3$ (3)

## $NH_4Cl$

C = $CH_4O$
Methyl alcohol (5)

| g B/kg A | | Mol C/kg A |
|---|---|---|
| 0° | 25° | |
| $NH_4Cl$ | | |
| 298.4 | 395.1 | 0 |
| 297.4 | 394.8 | 0.25 |
| 296.6 | 393.9 | 0.50 |
| 292.7 | 392.9 | 1.0 |
| 283.2 | 386.2 | 3.0 |

C = $C_2H_6O$
Ethyl alcohol

| g B/kg A | | Mol C/kg A |
|---|---|---|
| 0° (5) | 25° (4) | |
| $NH_4Cl$ | | |
| 298.4 | 395.1 | 0 |
| 295.5 | 396.4 | 0.25 |
| 292.0 | 390.6 | 0.50 |
| 286.4 | 387.0 | 1.0 |
| 266.3 | 371.2 | 3.0 |
| | 358.7 | 5.0 |

C = $C_3H_6O$
Acetone
$t$ = 25° (69)

| Mol B/l soln. | Vol. % C in (A + B) |
|---|---|
| $NH_4Cl$ | |
| One liquid phase | |
| 5.851 | 0 |
| 5.341 | 10 |
| 4.646 | 20 |
| 3.967 | 30 |
| 3.285 | 40 |
| Two liquid phases | |
| 2.837 | 46.5 |
| 0.189 | 85.7 |
| One liquid phase | |
| 0.094 | 90 |

C = $C_3H_8O$ (5)
Propyl alcohol

| g B/kg A | | Mol C/kg A |
|---|---|---|
| 0° | 25° | |
| $NH_4Cl$ | | |
| 298.4 | 395.1 | 0 |
| 295.4 | 393.5 | 0.25 |
| 291.3 | 390.8 | 0.50 |
| 284.0 | 384.8 | 1.0 |

C = $C_8H_6O_4$
Phthalic acid
$t$ = 25.00° (108)

| Mol B/l (A + B) | C,* Rel. solubility |
|---|---|
| $C_8H_6O_4$ | |
| 0.1403 | 0.99 |
| 0.286 | 0.96 |
| 0.580 | 0.92 |
| 0.888 | 0.885 |
| 1.350 | 0.82 |
| 1.895 | 0.735 |

* Unit of solubility is that in pure $H_2O$, which = 0.04185 g-Mol/l; ($a_4^{25}$ = 1.0022).

## $NH_4ClO_4$

C = $C_2H_6O$
Ethyl alcohol (136)

| $t°$ | g B/kg soln. | Vol. % C in (A+B) |
|---|---|---|
| $NH_4ClO_4$ | | |
| 14.2 | 17.35 | 0 |
| 25.2 | 19.65 | 98.8 |

## $(NH_4)_2SO_4$

C = $C_3H_6O$

Acetone; *v. also* Vol. III, p. 400

$t$ = 30° (69)

g/kg soln.

| A | C | B |
|---|---|---|
| | $(NH_4)_2SO_4$ | |
| One liquid phase | | |
| 562 | 0 | 438 |
| Two conjugate liquid phases | | |
| Aqueous layer | | |
| 565 | 13.0 | 422.0 |
| 604.7 | 12.2 | 383.1 |
| 644.0 | 16.0 | 340.0 |
| 675.1 | 66.7 | 258.2 |
| 674.5 | 86.5 | 239.0 |
| 680.5 | 165.0 | 154.5 |
| 680 | 210 | 110* |
| Acetone layer | | |
| 680 | 210 | 110* |
| 655.9 | 263.0 | 81.1 |
| 612.4 | 340.4 | 47.2 |
| 507.7 | 472.0 | 20.3 |
| 386.3 | 609.0 | 4.7 |
| 265.2 | 731.5 | 3.3 |
| 233.3 | 765.4 | 1.3 |
| One liquid phase | | |
| 121.4 | 878.0 | 0.6 |

$t$ = 0° (69)

g/kg soln.

| A | C | B |
|---|---|---|
| | $(NH_4)_2SO_4$ | |
| Limiting conjugate solutions | | |
| 612 | 8.5 | 379.5 |
| 422.9 | 571 | 6.1 |

* Critical solution.

## $CH_2O$

Formaldehyde

C = Amino acids (131)

$$\frac{C_{HCHO} \times C_{acid}}{C_{HCHO\text{-}acid}} = K$$

| Acid | K |
|---|---|
| $C_2H_5NO_2$, glycine | 1.73 |
| $C_3H_7NO_2$, alanine | 14.1 |
| $C_4H_7NO_4$, aspartic acid | 25.7 |
| $C_5H_9NO_4$, glutamic acid | 30.7 |
| $C_5H_{11}NO_2$, valine | 28.9 |
| $C_6H_{13}NO_2$, leucine | 36.8 |

## $CH_2O_2$

Formic acid

C = $C_2H_2O_4$

Oxalic acid

$t$ = 25° (80)

Mol/l soln.

| B | C |
|---|---|
| $C_2H_2O_4$ | |
| 0.097 | 1.191 |
| 0.437 | 1.193 |
| 0.967 | 1.206 |
| 1.287 | 1.207 |
| 1.825 | 1.221 |
| 2.678 | 1.215 |
| 5.360 | 1.163 |
| 8.13 | 1.066 |
| 11.00 | 0.934 |

C = $C_2H_2O_4$.—(*Continued*)

Mol/l soln.

| B | C |
|---|---|
| $C_2H_2O_4$ | |
| 12.17 | 0.879 |
| 16.63 | 0.748 |
| 19.25 | 0.784 |
| 21.11 | 1.170 |

C = $C_4H_6O_4$

Succinic acid

$t$ = 25° (80)

| $C_4H_6O_4$ | |
|---|---|
| 0.090 | 0.685 |
| 0.446 | 0.699 |
| 0.930 | 0.704 |
| 3.730 | 0.751 |
| 5.547 | 0.766 |
| 7.500 | 0.725 |
| 11.29 | 0.614 |

C = $C_7H_5NO_4$

*o*-Nitrobenzoic acid

$t$ = 25° (74)

| Mol B/l (A + B) | Mol C/l soln. |
|---|---|
| $C_7H_5NO_4$ | |
| 0.05168 | 0.04304 |
| 0.09977 | 0.04266 |

C = $C_7H_6O_3$

Salicylic acid

$t$ = 25° (74)

| Wt. % B in (A + B) | Mol C/l soln. |
|---|---|
| $C_7H_6O_3$ | |
| 0.0 | 0.01633 |
| 0.24 | 0.01531 |
| 0.46 | 0.01474 |
| 0.625 | 0.01484 |
| 1.25 | 0.01496 |
| 2.5 | 0.01536 |
| 5.0 | 0.01716 |
| 10.0 | 0.02101 |

C = $C_8H_8O_3$

Mandelic acid

$t$ = 25° (80)

Mol/l soln.

| B | C |
|---|---|
| $C_8H_8O_3$ | |
| 2.268 | 1.768 |
| 4.340 | 2.180 |
| 6.320 | 2.383 |
| 8.09 | 2.430 |
| 10.38 | 2.434 |
| 12.20 | 2.525 |
| 13.41 | 2.750 |
| 13.78 | 3.327 |

C = $C_9H_9NO_3$

Hippuric acid

$t$ = 25° (74)

| Wt. % B in (A + B) | Mol C/l soln. |
|---|---|
| $C_9H_9NO_3$ | |
| 0 | 0.02047 |
| 1.25 | 0.02014 |

C = $C_9H_9NO_3$.—(*Continued*)

| Wt. % B in (A + B) | Mol C/l soln. |
|---|---|
| $C_9H_9NO_3$ | |
| 2.5 | 0.02078 |
| 5 | 0.02275 |
| 10 | 0.02661 |

C = $C_{10}H_8$

Naphthalene (20)

Wt. % soln.

| $t$ = 0° | | $t$ = 25° | |
|---|---|---|---|
| B | C | B | C |
| $C_{10}H_8$ | | | |
| 76.6 | 0.106 | 56.2 | 0.089 |
| 84.5 | 0.188 | 67.8 | 0.168 |
| 92.2 | 0.331 | 81 | 0.4 |
| 97.7 | 0.477 | 91.6 | 0.725 |
| | | 97 | 1.185 |

## $CH_4O$

Methyl alcohol

C = $C_{10}H_8$ (20)

Naphthalene

Wt. % soln.

| $t$ = 0° | | $t$ = 25° | |
|---|---|---|---|
| B | C | B | C |
| $C_{10}H_8$ | | | |
| 80.7 | 0.91 | 43.10 | 0.11 |
| 86.82 | 1.83 | 56.5 | 0.34 |
| 95.32 | 3.72 | 65.1 | 0.75 |
| | | 69.52 | 1.18 |
| | | 79.2 | 2.4 |
| | | 86.5 | 4.55 |
| | | 90.86 | 8.77 |
| | | 91 | 8.84 |

C = $UO_2(HCO_2)_2$

$t$ = 18° (23)

| Vol % B in (A + B) | g C/kg (A + B) |
|---|---|
| $UO_2(HCO_2)_2$ | |
| 100 | 49.0 |
| 90 | Tr. |

C = $BaCl_2$ (78)

C = NaCl (5)

| Mol B/kg A | g C/kg A | |
|---|---|---|
| | 0° | 25° |
| NaCl | | |
| 0 | 357.8 | 363.0 |
| 0.25 | 355.2 | 359.4 |
| 0.50 | 353.1 | 357.6 |
| 1.0 | 347.5 | 353.2 |
| 3.0 | | 336.7 |

C = $Na_2Sb_2O_6.6H_2O$ (139)

| Solvent Vol. % B | $d_4^{15}$ | g C/l soln. 18° | 25° | 33.5° |
|---|---|---|---|---|
| $Na_2Sb_2O_6.6H_2O$ | | | | |
| 0 | | 0.564 | 0.738 | 1.018 |
| 20 | 0.9734 | 0.120 | 0.193 | 0.270 |
| 33.3 | 0.9559 | 0.044 | 0.095 | 0.150 |
| 50 | 0.9298 | 0.006 | 0.031 | 0.062 |

C = $NaC_6H_3N_2O_5.H_2O$

2, 4-Dinitrophenate

$t$ = 25° (38)

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| $NaC_6H_3N_2O_5.H_2O$ | |
| 0 | 44.61 |
| 10 | 36.86 |
| 20 | 31.96 |
| 30 | 29.50 |
| 40 | 28.54 |
| 50 | 28.24 |
| 60 | 27.92 |
| 70 | 26.72 |
| 80 | 25.18 |
| 90 | 24.75 |
| 100 | 46.51 |

C = KCl (5)

| Mol B/kg A | g C/kg A 0° | 25° |
|---|---|---|
| KCl | | |
| 0 | 283.6 | 364.2 |
| 0.25 | 280.0 | 361.9 |
| 0.50 | 276.4 | 357.1 |
| 1.0 | 267.9 | 348.7 |
| 3.0 | 238.1 | 324.2 |

C = $KC_6H_2N_3O_7$

Picrate

$t$ = 25° (38)

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| $KC_6H_2N_3O_7$ | |
| 0 | 6.45 |
| 10 | 5.42 |
| 20 | 4.70 |
| 30 | 4.44 |
| 40 | 4.22 |
| 50 | 4.11 |
| 60 | 4.10 |
| 70 | 3.96 |
| 80 | 3.32 |
| 90 | 2.54 |
| 100 | 2.74 |

## $CH_3NO$

Formamide

C = NaCl

$t$ = 25° (107)

| g B/l soln. | Mol C/l soln. |
|---|---|
| NaCl | |
| 0 | 5.44 |
| 23 | 5.30 |
| 53 | 5.28 |
| 80 | 5.20 |
| 110 | 4.98 |
| 150 | 4.89 |
| 188 | 4.75 |

C = $Na_2SO_4$

$t$ = 25° (91)

g/100 g soln.

| B | C |
|---|---|
| $Na_2SO_4.10H_2O$ | |
| 0 | 21.88 |
| 4.93 | 21.23 |

C = $Na_2SO_4$.—(*Continued*)

g/100 g soln.

| B | C |
|---|---|
| $Na_2SO_4.10H_2O$ + (?) | |
| 15.82 | 21.40 |
| (?) | |
| 16.97 | 20.85 |
| 21.70 | 17.90 |
| $4Na_2SO_4.CH_3NO$ | |
| 24.09 | 16.12 |
| 42.96 | 8.69 |
| 85.18 | 1.76 |
| 95.97 | 1.02 |

## $CH_4N_2O$

Urea

C = Various organic and inorganic acids

No numerical results, *v.* (138)

C = NaCl

$t$ = room (?) (37)

| g B/100 $cm^3$ soln. | Δ |
|---|---|
| NaCl | |
| 10 | 0.124 |
| 20 | 0.372 |
| 30 | 0.709 |
| 40 | 1.134 |
| 50 | 1.602 |

Δ = increase in solubility of C in grams.

$t$ = 25° (107)

| g B/l soln. | Mol C/l soln. |
|---|---|
| NaCl | |
| 0 | 5.44 |
| 50 | 5.24 |
| 96 | 4.97 |
| 130 | 4.87 |
| 180 | 4.73 |
| 230 | 4.66 |
| 280 | 4.55 |

## $CH_4N_2S$

Thiourea

C = $(NH_4)CNS$ (77); *cf.* (129)

Mol % soln.

| B | C | B | C |
|---|---|---|---|
| $(NH_4)CNS$ | | | |
| $t$ = 0° | | $t$ = 25.5° | |
| 2.9 | 0 | 5.2 | 4.3 |
| 1.7 | 3.8 | 6.0 | 6.8 |
| 2.2 | 4.4 | 5.8 | 7.0 |
| 2.1 | 4.9 | 4.8 | 9.8 |
| 2.1 | 5.0 | 4.4 | 12.3 |
| 2.4 | 6.6 | 4.6 | 12.3 |
| 1.3 | 7.6 | 4.4 | 14.6 |
| 1.3 | 9.6 | 4.3 | 14.9 |
| 2.1 | 21.6 | 4.4 | 15.4 |
| 1.3 | 21.8 | 3.9 | 18.1 |
| 0 | 22.4 | 4.1 | 19.5 |
| | | 4.3 | 20.9 |
| $t$ = 50° | | 4.1 | 23.6 |
| 0 | 39.1 | 4.4 | 24.0 |
| 2.6 | 39.9 | 4.0 | 24.1 |
| 7.6 | 39.6 | 3.9 | 26.9 |
| 8.2 | 38.1 | 4.0 | 27.6 |

C = $(NH_4)CNS$.—(*Cont'd*)

Mol % soln.

| B | C | B | C |
|---|---|---|---|
| $(NH_4)CNS$ | | | |
| $t$ = 50° | | $t$ = 25.5° | |
| 10.2 | 13.2 | 3.3 | 29.4 |
| 12.7 | 9.4 | 3.3 | 29.6 |
| 12.4 | 4.7 | 2.9 | 29.8 |
| 10.9 | 0 | 4.3 | 29.9 |
| | | 4.2 | 30.0 |
| | | 4.0 | 30.0 |
| | | 1.8 | 30.0 |
| | | 0 | 30.0 |

C = AgBr (94)

## $(NH_4)_2CO_3$

C = $C_2H_6O$

Ethyl alcohol (16)

| g B/kg (A + B) | Wt. % C in (A + B) |
|---|---|
| $(NH_4)_2CO_3$ | |
| $t$ = 6.5° | |
| 724 | 0.0 |
| 582 | 7.1 |
| 407 | 15.2 |
| 246 | 25.0 |
| 188 | 29.1 |
| 34 | 48.3 |
| $t$ = 9° | |
| 734 | 0.0 |
| 668 | 3.6 |
| 578 | 6.8 |
| 528 | 10.0 |
| 439 | 13.9 |
| 376 | 16.2 |
| 313 | 22.1 |
| $t$ = 15° | |
| 742 | 0.0 |
| 527 | 11.5 |
| 486 | 14.0 |
| 59 | 46.6 |
| 50 | 49.2 |
| 17 | 58.9 |
| 3 | 71.8 |
| 1 | 78.5 |
| 0 | 93.3 |

## $C_2H_2O_4$

Oxalic acid

C = $C_2H_4O_2$, Acetic acid

$t$ = 25° (80)

| Mol B/l soln. | Mol C/l soln. |
|---|---|
| $C_2H_2O_4$ | |
| 1.178 | 0.135 |
| 1.181 | 0.321 |
| 1.198 | 0.923 |
| 1.201 | 1.361 |
| 1.201 | 1.844 |
| 1.176 | 3.563 |
| 1.084 | 5.721 |
| 0.920 | 8.005 |
| 0.773 | 9.864 |
| 0.550 | 12.55 |
| 0.448 | 14.03 |
| 0.438 | 14.21 |
| 0.401 | 14.83 |

C = $(NH_4)_2C_2O_4$ (144)

Oxalate

D = $C_2H_2O_4.2H_2O$

E = $(NH_4)_2C_2O_4.2C_2H_2O_4.4H_2O$

F = $C_2H_2O_4.(NH_4)_2C_2O_4.2H_2O$

Wt. % soln.

| $t$ = 30° B | $t$ = 30° C | $t$ = 45° B | $t$ = 45° C |
|---|---|---|---|
| D | | D | |
| 12.36 | 0.14 | 21.01 | 0 |
| D + E | | 21.22 | 0.22 |
| 12.70 | 0.29 | 21.09 | 0.25 |
| E | | 21.21 | 0.27 |
| 10.46 | 0.37 | 21.32 | 0.30 |
| 11.44 | 0.43 | 21.31 | 0.31 |
| 8.87 | 0.47 | D + E | |
| 11.36 | 0.97 | 21.31 | 0.53 |
| 5.65 | 0.91 | E | |
| 4.65 | 1.14 | 21.23 | 0.56 |
| 3.55 | 3.60 | 20.55 | 0.61 |
| 4.00 | 5.91 | 20.92 | 0.54 |
| E + F | | 20.88 | 0.51 |
| 4.21 | 5.98 | 16.44 | 0.79 |
| F | | 12.28 | 1.23 |
| 4.08 | 6.21 | 7.98 | 2.16 |
| 3.56 | 6.79 | 5.83 | 3.54 |
| 3.82 | 6.73 | 5.67 | 5.65 |
| 3.96 | 6.02 | 5.55 | 6.72 |
| F + C | | E + F | |
| 3.28 | 8.35 | 6.53 | 8.75 |
| C | | F | |
| 2.76 | 7.40 | 6.27 | 8.93 |
| 0.22 | 5.53 | 6.14 | 9.04 |
| | | F + C | |
| | | 5.00 | 12.33 |
| | | C | |
| | | 3.04 | 8.31 |
| | | 1.45 | 9.59 |

C = $C_3H_6O_3$, Lactic acid

$t$ = 25° (80)

| Mol B/l soln. | Mol C/l soln. |
|---|---|
| $C_2H_2O_4$ | |
| 1.114 | 1.337 |
| 1.027 | 2.718 |
| 0.928 | 4.051 |
| 0.817 | 5.357 |
| 0.706 | 6.477 |
| 0.586 | 7.647 |
| 0.469 | 8.709 |
| 0.416 | 9.52 |

C = $Th(C_2O_4)_2$, Oxalate

$t$ = 25° (50)

| Mol B/kg soln. | g C/kg soln. |
|---|---|
| $Th(C_2O_4)_2.6H_2O$ | |
| 0.5 | 0.0023 |
| satd. soln. | 0.0046 |

$t$ = 50° (22)

| g B/kg soln. | g C/kg soln. |
|---|---|
| $Th(C_2O_4)_2$ | |
| 17 | 0.0035 |
| 65 | 0.012 |

C = $Th(C_2O_4)_2$.—(*Cont'd*)

| g B/kg soln. | g C/kg soln. |
|---|---|
| $Th(C_2O_4)_2$ | |
| 93 | 0.018 |
| 230 | 0.052 |

## C = $H_3BO_3$

Boric acid

$t$ = 25° (55)

Mol/l soln.

| B | C |
|---|---|
| $H_3BO_3$ | |
| 0 | 0.901 |
| 0.297 | 0.995 |
| 0.595 | 1.08 |
| 1.377 | 1.198 |
| $C_2H_2O_4$ | |
| 1.181 | 0 |
| 1.197 | 0.088 |
| 1.205 | 0.156 |
| 1.252 | 0.557 |
| 1.377 | 1.198 |

## C = $BeC_2O_4$

Oxalate

$t$ = 25° (143)

| Mol B/kg soln. | g C/kg soln. |
|---|---|
| $BeC_2O_4.3H_2O$ | |
| 0.0 | 24.94 |
| 0.05 | 27.80 |

## C = KOH

D = $C_2H_2O_4.2H_2O$

E = $KHC_2O_4.C_2H_2O_4.2H_2O$

F = $KHC_2O_4$

G = $C_2H_2O_4.2K_2C_2O_4.2H_2O$

H = $K_2C_2O_4.H_2O$

$t$ = 25° (49)

g/kg soln.

| $K_2O$ | $C_2O_3$ |
|---|---|
| D | |
| 0 | 82.90 |
| D + E | |
| 0.45 | 82.78 |
| E | |
| 0.64 | 74.12 |
| 2.38 | 28.27 |
| 2.46 | 24.45 |
| 3.46 | 20.07 |
| 5.55 | 17.90 |
| 5.67 | 17.34 |
| 17.14 | 26.75 |
| 20.52 | 30.79 |
| E + F | |
| 23.60 | 34.50 |
| F | |
| 31.99 | 37.93 |
| 59.19 | 54.57 |
| F + G | |
| 119.6 | 98.16 |
| G + H | |
| 157.1 | 123.65 |
| H | |
| 155.1 | 118.5 |

**$C_2H_2O_4$.—(*Continued*)**

C = $K_2C_2O_4$, Oxalate
D = $C_2H_2O_4.2H_2O$
E = $C_2H_2O_4.K_2C_2O_4.4H_2O$
F = $C_2H_2O_4.K_2C_2O_4.2H_2O$
G = $K_2C_2O_4.H_2O$
$t$ = 15° (71)
g/kg soln.

| B | C |
|---|---|
| D | |
| 71.0 | 0.0 |
| D + E | |
| 72.9 | 0.04 |
| E | |
| 35.9 | 2.82 |
| 10.08 | 10.1 |
| 9.20 | 13.9 |
| 12.2 | 25.6 |
| E + F | |
| 15.6 | 34.5 |
| F | |
| 14.8 | 37.6 |
| 8.8 | 98.8 |
| F + G | |
| 2.7 | 250.0 |
| G | |
| 1.4 | 245.6 |
| 0.0 | 242.0 |

**$C_2H_3Cl_3O_2$**
Chloral hydrate
C = $C_6H_6$
Benzene (17)
Mol B/kg

| $H_2O$ soln. | $C_6H_6$ soln. | $\Delta t$ |
|---|---|---|
| $C_6H_6$ | | |
| 5.125 | 0.675 | 1.305 |
| 5.066 | 0.623 | 1.229 |
| 4.872 | 0.585 | 1.180 |
| 4.424 | 0.545 | 1.104 |
| 3.890 | 0.290 | 0.714 |
| 2.419 | 0.200 | 0.539 |
| 1.309 | 0.105 | 0.314 |
| 0.663 | 0.050 | 0.184 |
| 0.339 | 0.025 | 0.114 |

$\Delta t$ = freezing-point depression of C.

**C = $K_2SO_4$; $t$ = 25° (42)**
Wt. % soln.

| B | C |
|---|---|
| $K_2SO_4$ | |
| 6.44 | 9.13 |
| 9.09 | 8.41 |
| 12.38 | 7.79 |
| 13.20 | 7.31 |
| 22.07 | 5.88 |
| 33.15 | 4.54 |
| 44.40 | 3.36 |
| 47.30 | 2.92 |
| 62.82 | 2.00 |
| 70.28 | 1.75 |
| 80.36 | 1.40 |
| 85.26 | 1.08 |

**$C_2H_4O_2$**
Acetic acid
C = $C_4H_6O_4$
Succinic acid
$t$ = 25° (80)
Mol/l soln.

| B | C |
|---|---|
| $C_4H_6O_4$ | |
| 0.078 | 0.692 |
| 0.448 | 0.708 |
| 0.916 | 0.726 |
| 2.828 | 0.796 |
| 4.536 | 0.822 |
| 6.655 | 0.820 |
| 8.661 | 0.760 |
| 10.34 | 0.679 |
| 12.40 | 0.549 |
| 14.64 | 0.399 |
| 16.85 | 0.257 |

**C = $C_4H_6O_6$**
Tartaric acid
$t$ = 25° (80)

| $C_4H_6O_6$ | |
|---|---|
| 0.25 | 5.45 |
| 0.60 | 4.938 |
| 1.23 | 4.758 |
| 2.63 | 4.359 |
| 4.24 | 3.859 |
| 6.12 | 3.274 |
| 8.30 | 2.576 |
| 10.89 | 1.753 |
| 14.14 | 0.797 |
| 16.92 | 0.172 |

**C = $C_6H_6$**
Benzene
$t$ = solidification temp. of mixture (17); *cf.* (109)
Mol/kg

| B $C_6H_6$ soln. | A satd. soln. |
|---|---|
| $C_6H_6$ | |
| 0.0 | 0.07 |
| 2.31 | 0.180 |
| 3.89 | 0.239 |
| 4.26 | 0.313 |

| Mol B/100 g $H_2O$ soln. | $C_6H_6$ soln. | $\Delta t$ |
|---|---|---|
| $C_6H_6$ | | |
| 1.1870 | 0.4245 | 8.930 |
| 1.2720 | 0.4130 | 8.713 |
| 0.8727 | 0.387 | 8.189 |
| 0.9976 | 0.383 | 8.100 |
| 1.0965 | 0.374 | 7.914 |
| 0.7070 | 0.2145 | 4.699 |
| 0.7272 | 0.2025 | 4.447 |
| 0.7859 | 0.1730 | 3.831 |
| 0.6806 | 0.1205 | 2.753 |
| 0.3961 | 0.035 | 0.980 |
| 0.2130 | 0.020 | 0.560 |

$\Delta t$ = freezing-point depression of C.

**C = $C_7H_6O_3$**
Salicylic acid
$t$ = 25° (74)

| Wt. % B in (A + B) | Mol C/l soln. |
|---|---|
| $C_7H_6O_3$ | |
| 0 | 0.01631 |
| 0.625 | 0.01691 |
| 1.25 | 0.01745 |
| 2.5 | 0.01846 |
| 5 | 0.02059 |

**C = $C_7H_7NO_2$**
*m*-Aminobenzoic acid
$t$ = 25° (8)
Wt. % soln.

| B | C |
|---|---|
| $C_7H_7NO_2$ | |
| 0.0 | 0.765 |
| 0.006 | 0.758 |
| 0.060 | 0.786 |
| 0.597 | 0.838 |
| 6.01 | 1.29 |
| 14.02 | 2.66 |
| 26.84 | 5.03 |
| 46.86 | 7.45 |
| 90.77 | 9.23 |

**C = $C_8H_6O_4$**
Phthalic acid
$t$ = 25.00° (108)

| Mol B/l (A + B) | C,* Rel. solubility |
|---|---|
| $C_8H_6O_4$ | |
| 0.1905 | 1.034 |
| 0.3484 | 1.063 |
| 0.732 | 1.177 |
| 1.039 | 1.245 |
| 1.523 | 1.372 |
| 2.016 | 1.575 |

* Unit of solubility is that in pure $H_2O$, which = 0.04185 g-Mol/l; ($d_4^{25}$ = 1.0022).

**C = $C_8H_7Cl_2NO$**
2, 4-Dichloroacetanilide
$t$ = room (99)

| Wt. % B in (A + B) | g C/l (A + B) |
|---|---|
| $C_8H_7Cl_2NO$ | |
| 100 | 64 |
| 50 | 8 |

**C = $C_8H_8N_2O_3$**
*p*-Nitroacetanilide
$t$ = room (99)

| $C_8H_8N_2O_3$ | |
|---|---|
| 100 | 8 |
| 50 | 4 |

**C = $C_8H_8O_3$**
Mandelic acid
$t$ = 25° (80)

| Mol B/l soln. | Mol C/l soln. |
|---|---|
| $C_8H_8O_3$ | |
| 0.87 | 1.81 |
| 1.34 | 2.31 |
| 1.86 | 2.66 |
| 2.62 | 3.19 |

**C = $C_8H_8O_3$.—(*Continued*)**

| Mol B/l soln. | Mol C/l soln. |
|---|---|
| $C_8H_8O_3$ | |
| 3.64 | 3.44 |
| 4.74 | 3.49 |
| 6.49 | 3.51 |
| 8.60 | 3.23 |
| 9.85 | 3.00 |
| 12.00 | 2.00 |

**C = $C_8H_{14}O_4$**
Suberic acid
$t$ = 25° (80)

| $C_8H_{14}O_4$ | |
|---|---|
| 0.435 | 0.0388 |
| 0.887 | 0.0451 |
| 2.112 | 0.0670 |
| 4.262 | 0.1446 |
| 6.350 | 0.2159 |
| 8.402 | 0.2923 |

**C = $C_{10}H_7NO_2$**
Nitroso-$\beta$-naphthol
$t$ = 10° (98)

| Wt. % B in (A + B) | g C/kg (A + B) |
|---|---|
| $C_{10}H_7NO_2$ | |
| 0 | 0.17 |
| 1 | 0.22 |
| 2.5 | 0.23 |
| 5 | 0.31 |
| 10 | 0.64 |

**C = $C_{10}H_8$**
Naphthalene (20)
Wt. % soln.

| 0° | | 25° | |
|---|---|---|---|
| B | C | B | C |
| $C_{10}H_8$ | | | |
| 71.4 | 0.482 | 39.7 | 0.098 |
| 81.1 | 1.2 | 47.5 | 0.195 |
| 87 | 1.92 | 56.5 | 0.39 |
| 89.9 | 2.58 | 60.1 | 0.486 |
| | | 68.7 | 0.967 |
| | | 74.5 | 1.57 |
| | | 79.4 | 2.42 |
| | | 80.5 | 2.69 |
| | | 83.2 | 3.59 |
| | | 84.7 | 4.81 |
| | | 86.7 | 6.07 |
| | | 86.9 | 7.3 |
| | | 86.3 | 12.3 |

**C = PbO**
D = $Pb(C_2H_3O_2)_2.2Pb(OH)_2$
E = $Pb(OH)(C_2H_3O_2)$
F = $Pb(C_2H_3O_2)_2.3H_2O$
$t$ = 25° (112)
Wt. % soln.

| B | C |
|---|---|
| C | |
| 0.20 | 1.00 |
| 0.48 | 1.07 |
| 0.54 | 1.05 |
| D | |
| 1.03 | 1.45 |
| 2.51 | 2.89 |
| 4.17 | 3.78 |
| 5.61 | 5.20 |

C = PbO.—(*Continued*)
Wt. % soln.

| B | C |
|---|---|
| D + E | |
| 7.26 | 7.15 |
| E | |
| 7.79 | 6.51 |
| 7.72 | 5.59 |
| E + F | |
| 7.92 | 5.18 |
| F | |
| 7.30 | 4.38 |
| 5.36 | 3.34 |
| 5.49 | 2.64 |
| 13.07 | 3.16 |
| 16.78 | 3.80 |
| 21.53 | 4.18 |

C = $PbCl_2$
$t$ = 25° (61)

| Mol B/l (A + B) | g C/l soln. |
|---|---|
| $PbCl_2$ | |
| 0 | 10.78 |
| 0.050 | 10.78 |
| 0.100 | 10.88 |
| 0.150 | 10.78 |
| 0.200 | 10.72 |
| 0.465 | 10.26 |
| 0.929 | 9.45 |
| 1.845 | 7.91 |
| 3.680 | 5.27 |

(59)

| Mol B/l (A + B) | Mol C/l soln. |
|---|---|
| $PbCl_2$ | |
| 0 | 0.03895 |
| 1.02 | 0.03365 |
| 2.05 | 0.02796 |
| 3.04 | 0.02266 |
| 3.94 | 0.01837 |
| 5.16 | 0.01446 |
| 5.87 | 0.01163 |
| 7.06 | 0.00887 |
| 7.93 | 0.00660 |
| 8.94 | 0.00505 |
| 10.17 | 0.00362 |
| 11.24 | 0.00258 |
| 12.20 | 0.00191 |
| 13.28 | 0.00136 |
| 14.90 | 0.00120 |
| Glacial | Tr. |

C = $Pb(C_2H_3O_2)_2$ (100)
Acetate

| Mol B/l (A + B) | g C/kg A | | |
|---|---|---|---|
| | 25° | 25° | 45° |
| $Pb(C_2H_3O_2)_2$ | | | |
| 0.025 | 541.7 | 875.5 | 1540.3 |
| 0.05 | 539.2 | 873.4 | 1537.6 |
| 0.10 | 535.1 | 868.7 | |
| 0.110 | | | 1533.4 |

C = TlCl
$t$ = 25° (60)

| Mol B/l (A + B) | Solution Mol C/l | $d_{25}^{25}$ |
|---|---|---|
| TlCl | | |
| 0.0 | 0.01629 | |
| 0.513 | 0.01580 | 1.0014 |
| 1.013 | 0.01495 | 1.0043 |
| 2.016 | 0.01325 | 1.0114 |
| 4.180 | 0.009945 | 1.0323 |
| 8.130 | 0.005399 | 1.0550 |
| 11.49 | 0.002594 | 1.0599 |
| 14.31 | 0.001221 | 1.0643 |
| 16.01 | 0.000478 | 1.0667 |

| Mol B/l (A + B) | g C/l soln. |
|---|---|
| TlCl (61) | |
| 0.0 | 3.8515 |
| 0.0501 | 3.8375 |
| 0.0958 | 3.8326 |
| 0.263 | 3.7503 |
| 0.524 | 3.6359 |

C = $HgC_2H_3O_2$
Acetate
$t$ = 21° (52); *cf.* (88)

| Mol B/l (A + B) | g C/l (A + B) |
|---|---|
| $HgC_2H_3O_2$ | |
| 0 | 1.024 |
| 2 | 0.730 |
| 4 | 0.690 |
| 6 | 0.650 |

C = $AgBrO_3$
$t$ = 25° (61)

| Mol B/l (A + B) | g C/l soln. |
|---|---|
| $AgBrO_3$ | |
| 0.0 | 1.9493 |
| 0.0498 | 1.9429 |
| 0.0997 | 1.9379 |
| 0.1995 | 1.9206 |
| 0.4988 | 1.8630 |
| 0.9975 | 1.8013 |
| 1.8721 | 1.6178 |

C = $AgC_2H_3O_2$
Acetate
$t$ = 25° (81)

| Mol B/l soln. | g C/l soln. |
|---|---|
| $AgC_2H_3O_2$ | |
| 0 | 11.13 |
| 1.00 | 10.73 |
| 2.00 | 10.32 |
| 2.98 | 9.98 |
| 4.19 | 9.52 |
| 4.98 | 9.19 |
| 5.99 | 8.72 |
| 6.80 | 8.29 |
| 8.01 | 7.73 |
| 8.97 | 7.31 |
| 9.96 | 6.78 |
| 11.02 | 6.15 |
| 12.32 | 5.33 |
| 12.97 | 4.96 |

C = $AgC_2H_3O_2$.—(*Cont'd*)

| Mol B/l soln. | g C/l soln. |
|---|---|
| $AgC_2H_3O_2$ | |
| 13.97 | 4.29 |
| 14.96 | 3.43 |
| 15.93 | 2.48 |
| 17.28 | 1.09 |

C = MgO
D = $Mg(C_2H_3O_2)_2.4H_2O$
E = $3C_2H_4O_2.2Mg(C_2H_3O_2)_2.3H_2O$
F = $10C_2H_4O_2.5Mg(C_2H_3O_2)_2.7H_2O$
$t$ = 25° (68)
Wt. % soln.

| B | C |
|---|---|
| C | |
| 3.36 | 1.73 |
| 5.65 | 2.93 |
| 8.06 | 4.21 |
| 12.46 | 6.54 |
| C + D | |
| 15.46 | 8.24 |
| D | |
| 15.38 | 8.31 |
| 14.25 | 7.24 |
| 20.19 | 7.47 |
| 22.93 | 7.60 |
| 26.61 | 7.74 |
| 31.37 | 7.99 |
| D + E | |
| 36.23 | 8.18 |
| E | |
| 35.77 | 8.17 |
| 40.87 | 7.42 |
| 47.86 | 6.74 |
| 56.16 | 5.81 |
| 61.59 | 4.68 |
| 65.19 | 4.36 |
| 69.13 | 3.75 |
| 75.93 | 2.85 |
| 82.90 | 2.23 |
| F | |
| 63.50 | 3.91 |
| 70.09 | 3.17 |
| 75.39 | 2.87 |
| 77.84 | 2.83 |
| 84.05 | 1.61 |
| 86.50 | 2.19 |

C = $Ba(C_2H_3O_2)_2$
D = $Ba(C_2H_3O_2)_2.3H_2O$
E = $3C_2H_4O_2.3Ba(C_2H_3O_2)_2.11H_2O$
F = $Ba(C_2H_3O_2)_2.2C_2H_4O_2$
$t$ = 25° (68)

| D | |
|---|---|
| 0 | 5.18 |
| 0.41 | 5.21 |
| 1.40 | 5.34 |
| E | |
| 1.46 | 5.32 |
| 2.42 | 4.03 |
| 3.30 | 3.48 |
| 5.61 | 3.04 |
| 10.23 | 3.14 |

C = $Ba(C_2H_3O_2)_2$.—(*Cont'd*)
Wt. % soln.

| B | C |
|---|---|
| E | |
| 16.92 | 3.24 |
| 20.60 | 3.62 |
| 26.48 | 4.41 |
| 28.72 | 4.52 |
| 33.14 | 5.23 |
| 36.54 | 5.60 |
| 42.08 | 7.85 |
| 45.28 | 8.82 |
| 46.51 | 8.87 |
| F | |
| 46.50 | 9.04 |
| 51.98 | 8.72 |
| 58.35 | 8.62 |
| 65.77 | 8.40 |
| 71.34 | 8.25 |
| 77.06 | 7.79 |
| 85.27 | 7.36 |

C = $NaC_2H_3O_2$
D = $NaC_2H_3O_2.3H_2O$
E = $C_2H_4O_2.NaC_2H_3O_2$ = $NaC_2H_3O_2.2C_2H_4O_2$
$t$ = 20° (1)
Mol % soln.

| B | C |
|---|---|
| D | |
| 0 | 9.50 |
| 1.52 | 9.54 |
| 3.52 | 9.92 |
| 7.50 | 10.60 |
| D + E | |
| 8.28 | 10.82 |
| E | |
| 11.74 | 10.52 |
| 16.58 | 10.40 |
| 18.56 | 10.34 |
| 22.86 | 10.46 |
| 28.64 | 10.50 |
| 33.54 | 10.86 |
| E + F | |
| 33.90 | 10.84 |
| F | |
| 37.64 | 10.48 |
| 43.36 | 10.28 |
| 52.06 | 9.78 |
| 63.30 | 9.26 |
| 81.30 | 8.40 |

$t$ = 25° (57)

| Mol B/l soln. | Mol C/l soln. |
|---|---|
| D | |
| 0 | 47.75 |
| 24.16 | 47.30 |

$C_2H_5NO_2$
Glycocoll
C = Salts
$t$ = 20° (145)

| Salt | Mol C/l (A + B) $C_2H_5NO_2$ | g B/l soln. |
|---|---|---|
| Nil | 0.0 | 196.3 |
| $MgCl_2$ | 0.49 | 226.0 |

### $C_2H_5NO_2$.—(*Cont'd*)

C = Salts.—(*Continued*)

| Salt | Mol C/l (A + B) soln. | g B/l $C_2H_5NO_2$ |
|---|---|---|
| $CaCl_2$ | 0.267 | 214.9 |
| | 0.534 | 234.9 |
| | 1.07 | 273.6 |
| | 2.14 | 350.8 |
| $CaBr_2$ | 0.51 | 249.7 |
| $Ca(NO_3)_2$ | 0.5 | 255.7 |
| $SrCl_2$ | 0.25 | 213.0 |
| | 0.5 | 233.1 |
| | 1.0 | 260.5 |
| | 2.0 | 330.1 |
| $SrBr_2$ | 0.49 | 244.1 |
| $Sr(NO_3)_2$ | 0.5 | 249 2 |
| $Sr(C_2H_3O_2)_2$ | 0.5 | 209 4 |
| $BaCl_2$ | 0.5 | 237.5 |
| $Ba(ClO_4)_2$ | 0.412 | 254.6 |
| | 0.617 | 271.8 |
| | 0.836 | 294.9 |
| $BaBr_2$ | 0.5 | 245.4 |
| $Ba(NO_3)_2$ | 0.5 | 248.6 |
| $Ba(C_2H_3O_2)_2$ | 0.5 | 210.0 |
| LiCl | 0.96 | 209.4 |
| LiBr | 0.97 | 212.3 |
| NaCl | 1.0 | 205.0 |
| | 2.0 | 209.0 |
| | 4.0 | 213.3 |
| $NaClO_4$ | 1.0 | 217.5 |
| NaBr | 1.0 | 206.7 |
| NaI | 0.96 | 209.5 |
| $NaNO_3$ | 0.5 | 207.5 |
| | 1.0 | 217.6 |
| | 2.0 | 231.3 |
| | 4.0 | 249.0 |
| $Na_2SO_4$ | 0.5 | 210.0 |
| $NaC_2H_3O_2$ | 1.0 | 182.3 |
| KCl | 0.5 | 197.9 |
| | 1.0 | 197.9 |
| | 2.0 | 196.4 |
| | 4.0 | 178.5 |
| KBr | 1.0 | 202.3 |
| KI | 1.0 | 204.4 |
| $KNO_3$ | 1.0 | 206.4 |
| $KC_2H_3O_2$ | 1.0 | 176.2 |
| | 2.0 | 156.9 |
| | 4.0 | 122.6 |
| KCNS | 0.98 | 198.9 |

| Salt | g C/l soln. | Mol B/l (A + B) C |
|---|---|---|
| $SrCl_2.6H_2O$ | 471.4 | 0.00 |
| | 475.4 | 0.25 |
| | 478.6 | 0.50 |
| | 484.6 | 1.00 |
| $BaCl_2.2H_2O$ | 340.5 | 0.00 |
| | 348.1 | 0.25 |
| | 356.8 | 0.50 |
| | 372.5 | 1.00 |
| NaCl | 326.5 | 0.00 |
| | 314.7 | 0.25 |
| | 313.2 | 0.50 |
| | 309.5 | 1.00 |

C = Salts.—(*Continued*)

| Salt | g C/l soln. | Mol B/l (A + B) C |
|---|---|---|
| KCl | 300.8 | 0.00 |
| | 298.9 | 0.25 |
| | 294.2 | 0.50 |
| | 282.9 | 1.00 |

### $C_2H_6O$

Ethyl alcohol

C = $C_4H_6O_6$

Tartaric acid

$t$ = 25° (124)

| Wt. % B in (A+B) | Wt. % C in soln. $C_4H_6O_6$ | $d_4^{25}$ soln. |
|---|---|---|
| 0.0 | 57.93 | 1.321 |
| 8.9 | 56.10 | 1.304 |
| 32.0 | 51.40 | 1.246 |
| 51.0 | 46.76 | 1.181 |
| 70.2 | 39.95 | 1.091 |
| 91.4 | 27.83 | 0.963 |
| 96.3 | 24.22 | 0 929 |
| 99.9 | 21.67 | 0.906 |

C = $C_5H_{10}O_5$

α-Xylose

$t$ = 20° (67)

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| 80 | 27 initial soly. |
| 80 | 62 final soly. |

C = $C_5H_{10}O_5$

α-Lyxose

$t$ = 20° (67)

| | |
|---|---|
| 90 | 54 initial soly. |
| 90 | 62 final soly. |

C = $C_5H_{10}O_5$

α-Arabinose

$t$ = 20° (67)

| | |
|---|---|
| 80 | 7.4 initial soly. |
| 80 | 19.4 final soly. |

C = $C_6H_6$

Benzene

$t$ = solidification temp. of mixture (17)

| Mol A/kg satd. soln. | Mol B/kg $C_6H_6$ C |
|---|---|
| 0.07 | 0.0 |
| 0.585 | 3.57 |
| 1.29 | 5.71 |
| 1.88 | 6.76 |

| Mol B/kg (17) $H_2O$ soln. | $C_6H_6$ soln. | $\Delta t$ |
|---|---|---|
| 22.81 | 3.200 | 2.847 |
| 16.79 | 2.640 | 2.742 |
| 15.39 | 2.405 | 2.673 |
| 13.02 | 1.885 | 2.481 |
| 11.22 | 1.565 | 2.324 |

C = $C_6H_6$.—(*Continued*)

| Mol B/kg $H_2O$ soln. | Mol B/kg $C_6H_6$ soln. | $\Delta t$ |
|---|---|---|
| 8.766 | 1.125 | 2.035 |
| 6.412 | 0.720 | 1.654 |
| 4.346 | 0.500 | 1.359 |
| 2.694 | 0.325 | 0.983 |
| 1.586 | 0.200 | 0.685 |

$\Delta t$ = freezing-point depression of C.

| Wt. % C in soln. | $t$°† (128) |
|---|---|
| 99.5 wt. % B‡ | |
| 92.42 | 2.95 |
| 80.29 | 1.26 |
| 75.32 | +0.50 |
| 70.92 | −0.14 |
| 67.05 | −0.86 |
| 62.05 | −1.94 |
| 57.85 | −2.94 |
| 54.16 | −4.16 |
| 50.15 | −5.42 |
| 98.0 wt. % B‡ | |
| 95.20 | 3.50 |
| 93.09 | 3.10 |
| 91.92 | 2.76 |
| 86.86 | 2.22 |
| 81.82 | 1.62 |
| 77.15 | 1.08 |
| 69.23 | +0.03 |
| 65.56 | −0.72 |
| 58.76 | −2.16 |
| 53.30 | −3.90 |
| 50.55 | −4.62 |
| 48.30 | −5.72 |
| 95.76 wt. % B‡ | |
| 94.50 | 3.48 |
| 89.60 | 2.84 |
| 81.15 | 1.86 |
| 77.51 | +1.48 |
| 65.70 | −0.12 |
| 59.35 | −1.04 |
| 55.46 | −1.92 |
| 52.04 | −2.75 |
| 49.02 | −3.62 |
| 46.34 | −4.42 |
| 43.94 | −5.34 |
| 90.06 wt. % B‡ | |
| 89.18 | 30.7* |
| 87.55 | 26.1* |
| 86.88 | 23.9* |
| 85.24 | 16.1* |
| 84.30 | 11.0* |
| 83.18 | 5.2* |
| 82.54 | 2.0* |
| 81.19 | 2.51 |
| 74.22 | 2.13 |
| 68.33 | 1.78 |
| 59.42 | 0.95 |

C = $C_6H_6$.—(*Continued*)

| Wt. % C in soln. | $t$°† |
|---|---|
| 90.06 wt. % B‡ | |
| 55.60 | +0.42 |
| 49.31 | −0.51 |
| 46.62 | −0.91 |
| 42.09 | −1.97 |
| 37.65 | −3.54 |
| 35.76 | −4.30 |
| 34.05 | −5.14 |
| 25.18 | −2.02 |
| 23.76 | −2.97 |
| 22.50 | −3.75 |
| 21.36 | −4.67 |
| 86.0 wt. % B‡ | |
| 73.89 | 28.3* |
| 72.81 | 22.7* |
| 71.63 | 17.6* |
| 70.35 | 12.9* |
| 68.93 | 8.5* |
| 67.38 | 4.5* |
| 80.10 wt. % B‡ | |
| 63.52 | 39.2* |
| 61.66 | 32.1* |
| 57.41 | 19.6* |
| 50.55 | 9.2* |
| 47.14 | 5.2* |
| 44.19 | 1.6* |
| 44.19 | 2.45 |
| 39.24 | 2.00 |
| 33.03 | 0.96 |
| 30.64 | +0.30 |
| 26.78 | −1.12 |
| 74.48 wt. % B‡ | |
| 44.43 | 29.5* |
| 38.23 | 20.3* |
| 35.12 | 15.2* |
| 31.02 | 7.75* |
| 28.90 | +3.00* |
| 27.04 | −1.25* |
| 27.04 | +2.30 |
| 24.03 | +1.20 |
| 18.64 | −2.25 |
| 17.65 | −3.10 |
| 15.96 | −4.85 |
| 69.08 wt. % B‡ | |
| 27.67 | 25.3* |
| 25.88 | 21.2* |
| 24.31 | 17.3* |
| 22.91 | 13.5* |
| 21.67 | 9.9* |
| 20.55 | 6.5* |
| 19.06 | 1.95* |
| 18.20 | 2.30 |
| 17.15 | 1.52 |
| 15.37 | +0.02 |
| 13.72 | −1.34 |
| 12.37 | −3.02 |
| 11.81 | −3.70 |
| 57.66 wt. % B‡ | |
| 10.53 | 15.4* |
| 10.05 | 12.15* |

† The temperature given is that at which benzene crystallizes out, unless marked with a * which indicates the formation of two liquid phases.

‡ % of B in (A+B), solvent.

C = $C_6H_6$.—(*Continued*)

| Wt. % C in soln. | $t$°† |
|---|---|
| 57.66 wt. % B‡ | |
| 9.25 | 7.1* |
| 8.56 | +2.3* |
| 8.27 | −0.40* |
| 8.27 | +2.15 |
| 6.66 | −2.92 |
| 6.34 | −4.20 |
| 39 wt. % B‡ | |
| <1.0 | 25.0* |
| Triple point | |
| 96.76 | 4.10 |
| 82.62 | 2.55 |
| 66.38 | 2.52 |
| 44.95 | 2.50 |
| 28.75 | 2.64 |
| 19.28 | 2.86 |
| 8.70 | 3.20 |

† The temperature given is that at which benzene crystallizes out, unless marked with a * which indicates the formation of two liquid phases.
‡ % of B in (A + B), solvent.

C = $C_6H_8O_7$
Citric acid
$t$ = 25° (124)

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| $C_6H_8O_7$ | | |
| 32.0 | 60.6 | 1.268 |
| 51.0 | 57.1 | 1.216 |
| 70.2 | 51.9 | 1.160 |
| 81.5 | 47.9 | 1.115 |
| 91.4 | 43.0 | 1.057 |
| 99.9 | 38.4 | 1.010 |

C = $C_6H_8O_7.H_2O$
Citric acid
$t$ = 25° (124)

| | | |
|---|---|---|
| $C_6H_8O_7.H_2O$ | | |
| 0 0 | 67.5 | 1.311 |
| 8.9 | 66.9 | 1.302 |
| 32.0 | 65.3 | 1.270 |
| 51.0 | 63.2 | 1.236 |
| 70.2 | 60.7* | 1.193 |
| 81.5 | 57.6* | 1.156 |
| 91.4 | 54.1* | 1.121 |
| 99.9 | 49.9* | 1.069 |

* During solution a change in crystalline phase occurs.

C = $C_6H_{12}O_6$
Sugars
$t$ = 20° (67)

| Sugar | Vol. % B* | g C/l soln. Init. C | g C/l soln. Final C |
|---|---|---|---|
| α-Glucose | 80 | 20 | 45 |
| α-Galactose | 60 | 11 | 31 |
| | 80 | 2.7 | 6.5 |
| β-Fructose | 80 | 134 | 274 |
| | 95 | 18 | 42 |
| β-Mannose | 80 | 24 | 130 |
| α-Rhamnose.$H_2O$ | 70 | 82 | 96 |
| α-Glucose.$H_2O$ | 80 | 13 | 30 |
| β-Glucose | 80 | 49 | 91 |

* In (A + B).

C = $C_6H_{13}N_3.HNO_3$
Galegine nitrate
$t$ = 17° (134)

| Vol. % B in (A + B) | g C/kg (A + B) |
|---|---|
| $C_6H_{13}N_3.HNO_3$ | |
| 0 | 44.8 |
| 95 | 256.4 |

C = $C_6H_{13}N_3.HCO_3$
Galegine bicarbonate
$t$ = 18° (134)

| | |
|---|---|
| $C_6H_{13}N_3.HCO_3$ | |
| 0 | 16.7 |
| 95 | 22.7 |

C = $(C_6H_{13}N_3)_2.H_2SO_4$
Galegine sulfate
$t$ = 19° (134)

| | |
|---|---|
| $(C_6H_{13}N_3)_2.H_2SO_4$ | |
| 0 | 42.9 |
| 60 | 43.5 |
| 80 | 20.8 |
| 95 | 2.62 |

C = $C_7H_5N_3O_6$
Trinitrotoluene (135)

| g C/kg (A+B) | $t$° |
|---|---|
| 95.07 vol. % B* | |
| $C_7H_5N_3O_6$ | |
| 7.0 | 0.3 |
| 19.9 | 32.0 |
| 29.8 | 40.1 |
| 37.0 | 45.0 |
| 46.1 | 50.0 |
| 60.8 | 55.0 |
| 81.4 | 59.8 |
| 114.0 | 65.0 |
| 185.8 | 74.0 |

* Vol. % B in (A + B), solvent.

C = $BiOC_7H_5O_3$
Basic salicylate
$t$ = 25° (124)

| Wt. % B in (A + B) | Wt. % C in soln. |
|---|---|
| $BiOC_7H_5O_3$ | |
| 0.0 | 0.010 |
| 20.0 | 0.015 |
| 40.0 | 0.022 |
| 60.0 | 0.036 |
| 80.0 | 0.065 |
| 90.0 | 0.095 |
| 92.3 | 0.105 |
| 100.0 | 0.160 |

C = $C_7H_6O_2$
Benzoic acid
$t$ = 25° (124)

| Wt. % B in (A + B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| $C_7H_6O_2$ | | |
| 0.0 | 0.367 | 1.0000 |
| 8.9 | 0.581 | 0.9865 |
| 32.0 | 4.667 | 0.9574 |
| 51.0 | 17.80 | 0.9464 |
| 70.2 | 30.07 | 0.9404 |

C = $C_7H_6O_2$.—(*Continued*)

| Wt. % B in (A + B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| $C_7H_6O_2$ | | |
| 83.0 | 35.05 | 0.9311 |
| 96.3 | 36.51 | 0.9128 |
| 99.8 | 36.91 | 0.9093 |

C = $C_7H_6O_3$
Salicylic acid
$t$ = 25° (124)

| | | |
|---|---|---|
| $C_7H_6O_3$ | | |
| 0.0 | 0.22 | 1.001 |
| 8.9 | 0.336 | 0.986 |
| 32.0 | 2.68 | 0.957 |
| 51.0 | 12.82 | 0.945 |
| 70.2 | 24.01 | 0.941 |
| 88.0 | 31.03 | 0.932 |
| 96.3 | 32.45 | 0.923 |
| 99.8 | 33.20 | 0.919 |

C = $C_7H_6O_5.H_2O$
Gallic acid
$t$ = 25° (124)

| | | |
|---|---|---|
| $C_7H_6O_5.H_2O$ | | |
| 0.0 | 1.15 | 1.002 |
| 17.0 | 3.31 | 0.985 |
| 41.7 | 11.16 | 0.974 |
| 70.2 | 18.01 | 0.946 |
| 89.6 | 21.17 | 0.919 |
| 99.9 | 22.14 | 0.902 |

C = $(NH_4)C_7H_5O_2$
Benzoate
$t$ = 25° (124)

| | | |
|---|---|---|
| $(NH_4)C_7H_5O_2$ | | |
| 0.0 | 18.6 | 1.043 |
| 8.9 | 18.0 | 1.029 |
| 32.0 | 18.1 | 0.993 |
| 51.0 | 16.9 | 0.954 |
| 70.2 | 12.1 | 0.900 |
| 91.4 | 3.8 | 0.825 |
| 96.3 | 2.5 | 0.808 |
| 99.9 | 1.6 | 0.796 |

C = $(NH_4)C_7H_5O_3$
Salicylate
$t$ = 25° (124)

| | | |
|---|---|---|
| $(NH_4)C_7H_5O_3$ | | |
| 0.0 | 50.8 | 1.148 |
| 8.9 | 50.8 | 1.137 |
| 32.0 | 49.3 | 1.104 |
| 70.2 | 42.0 | 1.014 |
| 88.0 | 33.1 | 0.946 |
| 91.4 | 30.5 | 0.932 |
| 96.3 | 26.5 | 0.901 |
| 99.8 | 22.3 | 0.875 |

C = $C_7H_{14}O_7$
β, α-Glucoheptose
$t$ = 20° (67)

| Vol. % B in (A + B) | g C/l soln. Init. | g C/l soln. Final |
|---|---|---|
| $C_7H_{14}O_7$ | | |
| 20 | 40 | 45 |

C = $C_9H_{10}ClNO$
2, 4-Acetylchlorotoluidine
$t$ = room (142)

| Vol. % B* in (A + B) | g C/kg (A + B) |
|---|---|
| $C_9H_{10}ClNO$ | |
| 33.3 | 2.6 |
| 50 | 19.6 |
| 100 | 62.7 |

C = $C_9H_{10}ClNO$
2, 5-Acetylchlorotoluidine
$t$ = room (142)

| | |
|---|---|
| $C_9H_{10}ClNO$ | |
| 33.3 | 4.8 |
| 50 | 83.0 |
| 100 | 62.0 |

* B as here used was 96 % ethyl alcohol.

C = $C_{10}H_8$
Naphthalene (20)
Wt. % soln.

| $t$ = 0° B | $t$ = 0° C | $t$ = 25° B | $t$ = 25° C |
|---|---|---|---|
| $C_{10}H_8$ | | | |
| 51.4 | 0.235 | 29.7 | 0.04 |
| 74.3 | 1.183 | 34.1 | 0.108 |
| 88.6 | 2.89 | 39.1 | 0.167 |
| 93.6 | 4.08 | 41.4 | 0.225 |
| | | 47.4 | 0.446 |
| | | 58.2 | 1.14 |
| | | 63.8 | 1.62 |
| | | 72.9 | 2.83 |
| | | 79.5 | 4.42 |
| | | 88.6 | 9.5 |

C = $C_{10}H_{16}O_4$
Camphoric acid
$t$ = 25° (124)

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| $C_{10}H_{16}O_4$ | | |
| 0.0 | 0.754 | 1.0 |
| 8.9 | 1.24 | 1.0 |
| 32.0 | 16.29 | 1.0 |
| 51.0 | 38.61 | 1.0 |
| 70.2 | 48.95 | 1.0 |
| 83.0 | 51.46 | 0.985 |
| 91.4 | 51.13 | 0.980 |
| 96.3 | 50.37 | 0.970 |
| 99.8 | 50.13 | 0.960 |

C = $C_{12}H_{22}O_{11}$
Sugars
$t$ = 20° (67)

| Sugar | Vol. % B* | g C/l soln. Init. C | g C/l soln. Final C |
|---|---|---|---|
| Sucrose | 80 | 37 | 37 |
| β-Cellose | 20 | 32 | 47 |
| α-Lactose.$H_2O$ | 40 | 11 | 24 |
| β-Maltose.$H_2O$ | 60 | 30 | 47 5 |
| β-Melibiose.$2H_2O$ | 80 | 7.6 | 13 |
| Trehalose.$2H_2O$ | 70 | 18 | 18 |

* In (A + B).

### $C_2H_6O$.—(*Continued*)

$C = C_{12}H_{22}O_{11}$
Sucrose
$t = 14°$ (113)
g/100 cm³ soln.

| A | B | C |
|---|---|---|
| | $C_{12}H_{22}O_{11}$ | |
| 45.10 | 0 | 87.5 |
| 43.83 | 8.52 | 74.5 |
| 38.02 | 28.13 | 47.1 |
| 29.57 | 46.28 | 18.8 |
| 12.83 | 71.18 | 0.9 |
| 3.28 | 77.39 | 0.36 |

$C = C_{13}H_{10}O_3$
Phenyl salicylate
$t = 25°$ (124)

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| | $C_{13}H_{10}O_3$ | |
| 0.0 | 0.015 | 0.999 |
| 8.9 | 0.018 | 0.985 |
| 32.0 | 0.067 | 0.950 |
| 51.0 | 0.861 | 0.912 |
| 70.2 | 4.44 | 0.877 |
| 88.0 | 11.91 | 0.863 |
| 96.3 | 26.68 | 0.878 |
| 99.8 | 34.73 | 0.897 |

$C = C_{16}H_{11}NO_2$
Phenylcinchoninic acid
$t$ = room (87)

| Vol. % B in (A + B) | g C/kg soln. |
|---|---|
| $C_{16}H_{11}NO_2$ | |
| 0 | 0.16 |
| 95 | 8.31 |

$C = C_{16}H_{32}O_2$
Palmitic acid (35)

| $t°$ | g C/l (A + B) |
|---|---|
| $C_{16}H_{32}O_2$ | |
| 50 wt. % B* | |
| 10 | 0.5 |
| 23 | 0.9 |
| 30 | 1.2 |
| 41 | 3.1 |
| 75 wt. % B* | |
| 10 | 2.4 |
| 20 | 4.3 |
| 30 | 11.9 |
| 40 | 35.9 |

* % B in (A + B), solvent.

$C = (NH_4)C_{16}H_{31}O_2$
Palmitate (35)

| | |
|---|---|
| $(NH_4)C_{16}H_{31}O_2$ | |
| 50 wt. % B* | |
| 23 | 53.3 |
| 41 | 66.92 |
| 75 wt. % B* | |
| 10 | 17.8 |
| 20 | 43.3 |
| 30 | 110.2 |
| 40 | 148.4 |

* % B in (A + B), solvent.

$C = C_{18}H_{32}O_{16}$
Raffinose
$t = 20°$ (67)

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| $C_{18}H_{32}O_{16}.5H_2O$ | |
| 50 | 14* |

* Initial and final solubility.

$C = C_{18}H_{36}O_2$
Stearic acid (35)

| $t°$ | g C/l solvent |
|---|---|
| $C_{18}H_{36}O_2$ | |
| 50 wt. % B* | |
| 23 | 0.8 |
| 30 | 1.0 |
| 41 | 1.2 |
| 75 wt. % B* | |
| 10 | 1.5 |
| 30 | 3.9 |
| 40 | 7.7 |

$t = 25°$ (124)

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| | $C_{18}H_{36}O_2$ | |
| 0.0 | 0.034 | 0.999 |
| 17.0 | 0.035 | 0.972 |
| 41.7 | 0.121 | 0.929 |
| 70.2 | 0.813 | 0.864 |
| 89.6 | 3.163 | 0.817 |
| 96.4 | 6.442 | 0.803 |
| 99.9 | 8.277 | 0.795 |

* % B in (A + B), solvent.

$C = (NH_4)C_{18}H_{33}O_2$
Oleate (35)

| $t°$ | Wt. % B in (A+B) | g C/l (A + B) |
|---|---|---|
| | $(NH_4)C_{18}H_{33}O_2$ | |
| 20 | 75 | 82.0 |
| 30 | 75 | 108.6 |

$C = (NH_4)C_{18}H_{35}O_2$
Stearate (35)

| $t°$ | g C/l (A + B) |
|---|---|
| | $(NH_4)C_{18}H_{35}O_2$ |
| 50 wt. % B* | |
| 12 | 2.5 |
| 23 | 5.1 |
| 30 | 11.6 |
| 41 | 32.1 |
| 75 wt. % B* | |
| 10 | 5.6 |
| 30 | 18.3 |
| 40 | 50 |

* % B in (A + B), solvent.

$C = C_{19}H_{22}N_2O$
Cinchonine
$t = 20°$ (114)

| Vol. % B in (A + B) | g C/ kg (A+B) |
|---|---|
| | $C_{19}H_{22}N_2O$ |
| 0 | 1.30 |
| 100* | 8.62 |

* $d_{25}^{25} = 0.832$.

$C = C_{21}H_{22}N_2O_2$
Strychnine
$t = 20°$ (114)

| Vol. % B in (A + B) | g C/kg (A + B) |
|---|---|
| | $C_{21}H_{22}N_2O_2$ |
| 0 | 0.39 |
| 100* | 8.33 |

* $d_{25}^{25} = 0.832$.

$C = C_{21}H_{22}N_2O_2.HNO_3$
Strychnine nitrate

| $t°$ | g C/kg (A + B) |
|---|---|
| 90 vol. % B* | |
| 15 | 9.23 |
| B.P. of B | 41.7 |

* Vol. % B in (A + B), solvent.

$C = C_{27}H_{30}N_2O_5.\frac{1}{2}H_2O$
Quinine salicylate
$t = 25°$ (124)

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| | $C_{27}H_{30}N_2O_5.\frac{1}{2}H_2O$ | |
| 0.0 | 53.56 | 1.252 |
| 8.9 | 52.10 | |
| 32.4 | 47.40 | 1.169 |
| 51.6 | 41.93 | 1.102 |
| 71.5 | 32.10 | 1.010 |
| 92.6 | 11.75 | 0.864 |
| 96.6 | 6.56 | 0.828 |
| 99.9 | 3.82 | 0.805 |

$C = PbCl_2$
$t = 25°$ (76)

| Mol B/l (A + B) | Mol C/l soln. |
|---|---|
| | $PbCl_2$ |
| 4 | 0.0172 |
| 2 | 0.0257 |
| 1 | 0.0298 |
| 0.5 | 0.0330 |
| 0.25 | 0.0338 |
| 0.125 | 0.0367 |
| 0 | 0.0388 |

$C = Pb(C_2H_3O_2)_2$
Acetate
$t = 25°$ (124)

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| | $Pb(C_2H_3O_2)_2.3H_2O$ | |
| 0.0 | 42.61 | 1.343 |
| 8.9 | 38.41 | 1.285 |
| 32.0 | 28.45 | 1.150 |
| 51.0 | 21.49 | 1.052 |
| 70.2 | 14.42 | 0.952 |
| | $Pb(C_2H_3O_2)_2$ | |
| 81.5 | 9.42 | 0.902 |
| 89.6 | 1.80 | 0.827 |
| 91.4 | 1.27 | 0.821 |
| 96.2 | 0.46 | 0.802 |
| 99.9 | 0.40 | 0.791 |

$C = Ga(NH_4)(SO_4)_2.12H_2O$
$t = 25°$ (29)

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| | $Ga(NH_4)(SO_4)_2.12H_2O$ |
| 0 | 308.4 |
| 50 | 0.217 |
| 70 | 0.0875 |

$C = Zn(C_2H_3O_2)_2$
Acetate
$t = 25°$ (124)

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| | $Zn(C_2H_3O_2)_2.2H_2O$ | |
| 0.0 | 30.78 | 1.168 |
| 8.9 | 27.64 | 1.132 |
| 32.0 | 19.78 | 1.048 |
| 70.2 | 7.90 | 0.878 |
| 91.4 | 4.16 | 0.832 |
| | $Zn(C_2H_3O_2)_2$ | |
| 96.3 | 3.87 | 0.822 |
| 99.9 | 1.18 | 0.796 |

$C = Zn(C_5H_9O_2)_2$
Valerate
$t = 25°$ (124)

| | | |
|---|---|---|
| | $Zn(C_5H_9O_2)_2$ | |
| 0.0 | 1.437 | 1.004 |
| 17.0 | 0.900 | 0.976 |
| 26.4 | 0.723 | 0.961 |
| 41.7 | 0.809 | 0.933 |
| 51.0 | 0.998 | 0.914 |
| 81.5 | 1.841 | 0.844 |
| 89.6 | 3.143 | 0.827 |
| 91.4 | 4.397 | 0.826 |
| 93.6 | 7.148 | 0.830 |
| 96.3 | 10.53 | 0.835 |
| 99.9 | 15.61 | 0.844 |

$C = Zn(C_6H_5SO_4)_2.8H_2O$
*p*-Phenolsulfonate
$t = 25°$ (124)

| | | |
|---|---|---|
| $Zn(C_6H_5SO_4)_2.8H_2O$ | | |
| 0.0 | 39.81 | 1.185 |
| 8.9 | 40.11 | 1.174 |
| 17.0 | 40.53 | 1.165 |
| 26.4 | 41.24 | 1.155 |
| 51.0 | 42.12 | 1.124 |
| 70.2 | 40.85 | 1.080 |
| 89.6 | 41.34 | 1.047 |
| 99.9 | 48.77 | 1.075 |

$C = Ag_2O$ (78.1)

$C = Ag_2CrO_4$ (48)

$C = [(CH_3)_2NH]_2H_2PtCl_6$
$t = 0°$ (11)

| Vol. % B in (A + B) | g C/kg (A + B) |
|---|---|
| | $[(CH_3)_2NH]_2H_2PtCl_6$ |
| 90 | 1.10 |
| 80 | 3.25 |
| 70 | 5.58 |
| 60 | 9.96 |

### C = $[(CH_3)_3N]_2H_2PtCl_6$

$t$ = 0° (11)

| Vol. % B in (A + B) | g C/kg (A + B) |
|---|---|
| $[(CH_3)_3N]_2H_2PtCl_6$ | |
| 90 | 0.70 |
| 80 | 2.43 |
| 70 | 3.91 |
| 60 | 7.66 |

### C = $MnSO_4$ (121)

*See also* Vol. III, Table 3, p. 404

| $t$° | Wt. % soln. $H_2O$ layer B | $H_2O$ layer C | $C_2H_6O$ layer B | $C_2H_6O$ layer C |
|---|---|---|---|---|
| | $MnSO_4.5H_2O$ | | | |
| 10 | 13.78 | 25.25 | 37.06 | 5.44 |
| 15 | 9.25 | 29.79 | 44.56 | 2.79 |
| 17.6 | 8.53 | 30.88 | 47.11 | 2.22 |
| 21 | 6.10 | 35.05 | 53.55 | 1.10 |
| 25 | 6.81 | 33.72 | 53.09 | 1.23 |
| | $MnSO_4.H_2O$ | | | |
| 30 | 8.69 | 30.15 | 45.20 | 2.49 |
| 31 | 8.47 | 30.10 | 43.90 | 2.74 |
| 35 | 9.24 | 28.61 | 41.71 | 3.44 |
| 37 | 11.03 | 26.47 | 38.26 | 4.84 |
| 41 | 11.93 | 24.97 | 34.01 | 5.86 |
| 42 | 13.57 | 23.09 | 32.37 | 6.89 |
| 43 | 14.33 | 22.01 | 31.42 | 8.51 |

| Wt. % soln. B | C |
|---|---|
| $t$ = 25° | |
| $MnSO_4.5H_2O$ | |
| 0 | 39.3 |
| Two satd. conjugate phases | |
| 6.81 | 33.72 |
| 53.09 | 1.23 |
| $MnSO_4.5H_2O$ | |
| 57.39 | 0.56 |
| $MnSO_4.H_2O$ | |
| 76.70 | 0.0 |
| $t$ = 30° | |
| $MnSO_4.5H_2O$ | |
| 0 | 38.60 |
| 2.26 | 36.31 |
| 5.09 | 33.66 |
| 5.96 | 33.26 |
| Two satd. conjugate phases | |
| 8.69 | 30.15 |
| 45.20 | 2.49 |
| $MnSO_4.5H_2O$ | |
| 54.19 | 0.98 |
| 68.97 | 0.08 |
| 90.80 | 0.01 |
| $t$ = 35° | |
| $MnSO_4.5H_2O$ | |
| 0 | 38.60 |
| 5.50 | 32.37 |
| 6.46 | 31.48 |
| 7.48 | 30.51 |
| Two satd. conjugate phases | |
| 9.24 | 28.61 |
| 41.71 | 3.44 |
| $MnSO_4.5H_2O$ | |
| 47.73 | 1.58 |
| 48.27 | 1.57 |

### C = $MnSO_4$.—(*Continued*)

| Wt. % soln. B | C |
|---|---|
| $t$ = 50° | |
| $MnSO_4.5H_2O$ | |
| 0 | 36.26 |
| 6.67 | 28.12 |
| 16.02 | 18.75 |
| 22.63 | 12.54 |
| 36.47 | 4.12 |

### C = $CaS_2O_6$

$t$ = 30° (6)

| | |
|---|---|
| $CaS_2O_6.4H_2O$ | |
| 0 | 23.29 |
| 16.50 | 12.55 |
| 40.39 | 3.31 |
| 50.96 | 1.39 |
| 73.08 | 0.11 |
| 82.79 | 0.063 |
| 92.47 | 0.059 |
| 99.80 | 0.00 |

### C = $Ca(NO_3)_2$

$t$ = 25° (26)

| | |
|---|---|
| $Ca(NO_3)_2.4H_2O$ | |
| 0 | 57.5 |
| 3.5 | 56.1 |
| 8.1 | 55.2 |
| 14.1 | 52.9 |
| 22.3 | 50.2 |
| 29.4 | 49.0 |
| 31.1 | 49.7 |
| 31.2 | 52.0 |
| 29.5 | 56.2 |
| 28.3 | 58.9 |
| 27.8 | 60.0 |
| 27.3 | 60.7 |
| $Ca(NO_3)_2$ + $Ca(NO_3)_2.4H_2O$ | |
| 26.5 | 62.3 |
| $Ca(NO_3)_2$ | |
| 27.4 | 62.0 |
| 28.5 | 61.2 |
| $Ca(NO_3)_2$ + $Ca(NO_3)_2.2C_2H_6O$ | |
| 29.9 | 60.3 |
| $Ca(NO_3)_2.2C_2H_6O$ | |
| 35.8 | 55.3 |
| 42.5 | 51.0 |
| 54.6 | 41.9 |
| 60.2 | 38.6 |
| Metastable systems | |
| $Ca(NO_3)_2$ | |
| 0 | 82.5 |
| 5.8 | 77.0 |
| 15.2 | 69.5 |
| 20.4 | 66.1 |
| 22.4 | 64.9 |
| 35.9 | 57.7 |
| 48.1 | 51.4 |

### C = $CaC_2O_4$, Oxalate (48)

### C = $SrS_2O_6$

$t$ = 30° (6)

| | |
|---|---|
| $SrS_2O_6.4H_2O$ | |
| 0 | 14.90 |
| 14.48 | 5.40 |

### C = $SrS_2O_6$.—(*Continued*)

| Wt. % soln. B | C |
|---|---|
| $SrS_2O_6.4H_2O$ | |
| 37.22 | 0.68 |
| 60.39 | 0.08 |
| 76.13 | 0.0012 |
| 90.05 | 0.00 |
| 98.53 | 0.00 |

### C = $Sr(NO_3)_2$

$t$ = 25° (26)

| | |
|---|---|
| $Sr(NO_3)_2.4H_2O$ | |
| 0 | 44.3 |
| 1.7 | 42.8 |
| 2.6 | 42.1 |
| 4.95 | 40.4 |
| 7.95 | 37.6 |
| 11.75 | 34.7 |
| $Sr(NO_3)_2$ + $Sr(NO_3)_2.4H_2O$ | |
| 12.4 | 34.3 |
| $Sr(NO_3)_2$ | |
| 13.8 | 33.2 |
| 32.4 | 20.5 |
| 53.6 | 10.5 |
| 77.2 | 2.60 |
| 99.4 | 0.02 |
| Metastable systems | |
| $Sr(NO_3)_2$ | |
| 0 | 46.6 |
| 3.45 | 42.7 |
| 6.0 | 40.1 |
| 9.5 | 36.7 |
| 10.45 | 35.7 |

### C = $Sr(C_7H_5O_3)_2.2H_2O$

Salicylate

$t$ = 25° (124)

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| $Sr(C_7H_5O_3)_2.2H_2O$ | | |
| 0.0 | 5.04 | 1.022 |
| 8.9 | 4.91 | 1.007 |
| 32.4 | 6.55 | 0.979 |
| 51.6 | 8.02 | 0.945 |
| 71.5 | 5.80 | 0.891 |
| 96.6 | 1.24 | 0.804 |
| 99.9 | 0.44 | 0.790 |

### C = $BaCl_2$ (119)

| Wt. % soln. B | C |
|---|---|
| $t$ = 30° | |
| $BaCl_2.2H_2O$ | |
| 0 | 27.95 |
| 32.7 | 10.63 |
| 50.2 | 5.68 |
| 66.72 | 2.23 |
| $BaCl_2.2H_2O$ + $BaCl_2.H_2O$ | |
| 94.7 | 0.06 |
| $BaCl_2.H_2O$ | |
| 97.14 | |
| 98.17 | 0.08 |
| $BaCl_2$ | |
| 99.41 | |

### C = $BaCl_2$.—(*Continued*)

| Wt. % soln. B | C |
|---|---|
| $t$ = 60° | |
| $BaCl_2.2H_2O$ | |
| 0 | 31.57 |
| 16.68 | 20.16 |
| 34.1 | 13.21 |

### C = $BaS_2O_6$

$t$ = 30° (6)

| | |
|---|---|
| $BaS_2O_6.2H_2O$ | |
| 0 | 19.86 |
| 4.67 | 12.74 |
| 16.86 | 4.24 |
| 21.36 | 2.74 |
| 31.91 | 0.86 |
| 42.53 | 0.37 |
| 61.24 | 0.03 |
| 76.61 | 0.01 |
| 87.00 | 0.009 |
| 88.69 | 0.00 |
| 98.81 | 0.00 |

### C = $Ba(NO_3)_2$

$t$ = 25° (26)

| | |
|---|---|
| $Ba(NO_3)_2$ | |
| 0 | 9.55 |
| 9.5 | 7.63 |
| 17.5 | 6.02 |
| 23.7 | 5.25 |
| 38.8 | 3.53 |
| 57.0 | 1.85 |
| 78.2 | 0.62 |
| 89.9 | 0.18 |
| 99.4 | 0.005 |

### C = $Ba(C_2H_3O_2)_2$

Acetate (25)

### C = $Ba(C_3H_5O_2)_2$

Propionate (25)

### C = $Ba(C_4H_7O_2)_2$

Butyrate (25)

### C = $Ba(C_6H_2N_3O_7)_2$

Picrate

$t$ = 25° (38)

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| $Ba(C_6H_2N_3O_7)_2.5H_2O$ | |
| 0 | 12.60 |
| 10 | 10.37 |
| 15 | 8.89 |
| 20 | 9.63 |
| 30 | 14.82 |
| $Ba(C_6H_2N_3O_7)_2.4H_2O$ | |
| 40 | 21.49 |
| 45 | 12–23 |
| 50 | 31.87 |
| 60 | 34.83 |
| 65 | 34.83 |
| 70 | 33.35 |
| 80 | 31.87 |
| 85 | 31.87 |
| 95 | 29.64 |
| 100 | 53.36 |

$C_2H_6O$.—(*Continued*)

C = $Ba(C_7H_3N_2O_7)_2$
Dinitrosalicylate
$t$ = 25° (38)

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| $Ba(C_7H_3N_2O_7)_2$ | |
| 0 | 6.30 |
| 10 | 5.24 |
| 20 | 4.38 |
| 30 | 5.70 |
| 40 | 7.94 |
| 50 | 11.24 |
| 60 | 9.45 |
| 70 | 9.15 |
| 80 | 8.94 |
| 90 | 3.20 |
| 100 | 3 82 |

C = $BaCrO_4$
$t$ = room (48)

C = LiCl
$t$ = 25° (104)
Wt. % in (A + B)

| B | C |
|---|---|
| LiCl | |
| 0 | 81.49 |
| 10.38 | 73.97 |
| 18.50 | 67.24 |
| 29.82 | 60.58 |
| 35.01 | 57.91 |
| 40.26 | 53.13 |
| 45.10 | 49.84 |
| 54.87 | 42.90 |
| 66.64 | 35.24 |
| 71.86 | 33.24 |
| 75.90 | 30.51 |
| 80.96 | 28.33 |
| 90.10 | 27.33 |
| 100 | 26.18 |

C = $Li_3SbS_4$
$t$ = 30° (119)
Wt. % in soln.

| B | C |
|---|---|
| $Li_3SbS_4.8½H_2O$ | |
| 0 | 50.8 |
| 13.3 | 46.3 |
| 51.9 | 30.7 |
| 54.8 | 29.9 |
| 58.4 | 30.8 |
| $Li_3SbS_4 + Li_3SbS_4.8½H_2O$ | |
| 58.6 | 32.3 |
| $Li_3SbS_4$ | |
| 65.3 | 29.3 |
| 74.3 | 24.1 |
| 79.5 | 20.5 |

C = $Li_3(C_6H_5O_7).4H_2O$
Citrate
$t$ = 25° (124)

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| $Li_3(C_6H_5O_7).4H_2O$ | | |
| 0.0 | 42.70 | 1.2160 |
| 8.9 | 33.50 | 1.1570 |
| 17.0 | 29.00 | 1.1150 |

C = $Li_3(C_6H_5O_7).4H_2O$.—(*Continued*)

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| $Li_3(C_6H_5O_7).4H_2O$ | | |
| 26.4 | 18.50 | 1.0430 |
| 41.7 | 7.90 | 0.9692 |
| 51.0 | 4.40 | 0.9296 |
| 70.2 | 0.54 | 0.8674 |
| 89.6 | 0.06 | 0.8166 |
| 99.9 | 0.02 | 0.7883 |

C = $Li(C_7H_5O_2)$
Benzoate
$t$ = 25° (124)

| $Li(C_7H_5O_2)$ | | |
|---|---|---|
| 0.0 | 27.64 | 1.103 |
| 8.9 | 28.52 | 1.090 |
| 32.0 | 27.79 | 1.047 |
| 51.0 | 23.46 | 0.999 |
| 70.2 | 15.23 | 0.931 |
| 91.4 | 5.98 | 0.838 |
| 96.2 | 4.02 | 0.815 |
| 99.9 | 2.61 | 0.799 |

C = $Li(C_7H_5O_3).½H_2O$
Salicylate
$t$ = 25° (124)

| $Li(C_7H_5O_3).½H_2O$ | | |
|---|---|---|
| 0.0 | 56.0 | 1.209 |
| 8.9 | 55.9 | |
| 32.4 | 54.2 | 1.159 |
| 51.6 | 52.0 | 1.120 |
| 71.5 | 49.2 | 1.060 |
| 92.6 | 45.4 | 1.021 |
| 96.6 | 45.6 | 1.018 |
| 99.9 | 48.2 | 1.027 |

C = NaCl
$t$ = 0° (5)

| Mol B/kg A | g C/kg A |
|---|---|
| NaCl | |
| 0 | 359.65 |
| 0.25 | 355.15 |
| 0.50 | 349.65 |
| 1.0 | 337.80 |
| 3.0 | 301.60 |

$t$ = 25° (4)

| NaCl | |
|---|---|
| 0 | 361.4 |
| 0.25 | 356.3 |
| 0.50 | 352.2 |
| 1.0 | 344.2 |
| 2.0 | 331.5 |
| 5.0 | 295.3 |

$t$ = 30° (21); *cf.* (40)
Wt. % soln.

| B | C |
|---|---|
| NaCl | |
| 0 | 26.5 |
| 6.3 | 23.5 |
| 7.7 | 22.6 |
| 13.4 | 20.5 |
| 21.4 | 17.7 |

C = NaCl.—(*Continued*)
Wt. % soln.

| B | C |
|---|---|
| NaCl | |
| 25.3 | 15.7 |
| 29.2 | 15.0 |
| 40.8 | 11.2 |
| 45.3 | 9.3 |
| 50 | 8.4 |
| 56.2 | 6.4 |
| 61.9 | 4.8 |
| 67.4 | 3.7 |
| 73.4 | 2.9 |
| 78.7 | 1.6 |
| 87.2 | 0.9 |
| 90.0 | 0.4 |
| 99.9 | 0.1 |

C = $NaClO_4$ (19)

| $t$° | Wt. % B in (A+B) | g C/l soln. |
|---|---|---|
| $NaClO_4$ | | |
| 20 | 90 | 16.1 |
| | 75 | 110.8 |
| | 50 | 311.3 |
| 40 | 90 | 22.9 |
| | 75 | 133.5 |
| | 50 | 321.8 |
| 60 | 90 | 29.0 |
| | 75 | 155.8 |
| | 50 | 326.8 |
| 70 | 75 | 161.3 |

C = NaBr
$t$ = 30° (21)
Wt. % soln.

| B | C |
|---|---|
| $NaBr.2H_2O$ | |
| 0 | 59.4 |
| 11.79 | 42.90 |
| 31.78 | 32.12 |
| 43.22 | 26.79 |
| 54.59 | 20.83 |
| 65.51 | 16.08 |
| 72.36 | 13.41 |
| $NaBr.2H_2O + NaBr$ | |
| 76.92 | 12.03 |
| NaBr | |
| 87.35 | 7.44 |
| 97.08 | 3.01 |

C = NaI
$t$ = 30° (21)

| $NaI.2H_2O$ | |
|---|---|
| 0 | 65.52 |
| 3.40 | 64 |
| 18.5 | 54.2 |
| 18.8 | 54 |
| 28.5 | 48.8 |
| 41.7 | 42.35 |
| 53.2 | 38.5 |
| 54.7 | 37.91 |
| $NaI.2H_2O + NaI$ | |
| 55.37 | 37.49 |
| NaI | |
| 59.24 | 35.65 |
| 61.78 | 33.24 |
| 68.70 | 30.90 |

C = $Na_2SO_4$
$t$ = 25° (118)
Wt. % soln.

| B | C |
|---|---|
| $Na_2SO_4.10H_2O$ | |
| 0 | 21.9 |
| 9.3 | 12.2 |
| 22.9 | 4.3 |
| 34.84 | 1.75 |
| 50.5 | 0.5 |
| $Na_2SO_4.10H_2O + Na_2SO_4$ | |
| 53.0 | 0.4 |
| 54.0 | 0.4 |
| $Na_2SO_4$ | |
| 64.95 | 0.15 |

| Wt. % B in (A + B) | g C/kg (A + B) |
|---|---|
| (16) | |
| $Na_2SO_4.10H_2O$ | |
| $t$ = 15° | |
| 0.0 | 127 |
| 9.2 | 67 |
| 19.4 | 26 |
| 39.7 | 5 |
| 58.9 | 1 |
| 72 | 0.4 |
| $t$ = 25° | |
| 0.0 | 282 |
| 10.6 | 139 |
| 24.0 | 45 |
| 54 | 4 |
| $Na_2SO_4.7H_2O$ | |
| $t$ = 15° | |
| 0.0 | 374 |
| 11.2 | 163 |
| 20.6 | 70 |
| 30.2 | 20 |
| $Na_2SO_4$ | |
| $t$ = 36° | |
| 0.0 | 493 |
| 8.8 | 292 |
| 12.8 | 224 |
| 17.9 | 154 |
| 18.1 | 153 |
| 28.9 | 54 |
| 48.7 | 8 |
| $t$ = 45° | |
| 0.0 | 479 |
| 9.0 | 275 |
| 14.5 | 192 |
| 20.6 | 123 |
| 31.0 | 51 |

Solutions in equilibrium with $Na_2SO_4$ and $Na_2SO_4.10H_2O$
Wt. % soln.

| $t$° | A | B | C |
|---|---|---|---|
| 32.5 | 66.7 | 0 | 33.3 |
| 31 | 71 | 9 | 20 |
| 30.5 | 71 | 18 | 11 |
| 30.3 | 66 | 29 | 5 |
| 30 | 64.5 | 32 | 3.5 |
| 25 | 46 | 54 | 0.4 |
| 20 | 35 | 65 | 0.1 |
| 15 | 28 | 72 | 0.0 |
| 10 | 24 | 76 | 0.0 |

### C = $NaNO_3$

$t$ = 25° (5)

| Mol B/kg A | g C/kg A |
|---|---|
| | $NaNO_3$ |
| 0 | 920.3 |
| 0.25 | 908.8 |
| 0.50 | 896.6 |
| 1.0 | 871.0 |
| 2.0 | 825.4 |

### C = $Na_2Sb_2O_6.6H_2O$ (139)

| Solvent Vol. % B | $d_{15}^{15}$ | g C/l soln. 18° | 25° | 33.5° |
|---|---|---|---|---|
| | | $Na_2Sb_2O_6.6H_2O$ | | |
| 0 | | 0.564 | 0.738 | 1.018 |
| 20 | 0.9774 | 0.118 | 0.150 | 0.403 |
| 33.33 | 0.9618 | 0.038 | 0.060 | 0.140 |
| 50 | 0.9370 | 0.001 | 0.004 | 0.008 |

### C = $Na_2CO_3$

$t$ = 30° (21)

| Wt. % soln. B | C |
|---|---|
| | $Na_2CO_3.10H_2O$ |
| 0 | 27.40 |
| 2.64 | 26.61 |
| 3.41 | 26.14 |
| 44.8 | 1.38 |
| 53.0 | 0.62 |
| 53.3 | 0.61 |
| $Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$ | |
| 55.7 | 0.53 |
| | $Na_2CO_3.7H_2O$ |
| 56.6 | 0.51 |
| 62.6 | 0.47 |
| 63.2 | 0.40 |
| 72.8 | 0.15 |
| $Na_2CO_3.7H_2O + Na_2CO_3.H_2O$ | |
| 73.1 | 0.11 |
| | $Na_2CO_3.H_2O$ |
| 80.0 | 0.07 |
| 86.8 | 0.06 |
| 93.1 | 0.04 |
| 95.1 | 0.03 |
| | $Na_2CO_3$ |
| 95.7 | * |
| 98.5 | * |

* Solubility negligible.

### C = $NaC_2H_3O_2$

Acetate

$t$ = 25° (124)

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| | $NaC_2H_3O_2$ | |
| 0.0 | 55.75 | 1.209 |
| 8.9 | 53.22 | 1.162 |
| 32.0 | 45.59 | 1.104 |
| 51.0 | 36.44 | 1.034 |
| 70.2 | 22.18 | 0.941 |
| 81.4 | 11.74 | 0.876 |
| 91.4 | 6.28 | 0.834 |
| 99.9 | 7.31 | 0.823 |

### C = $Na_3C_6H_5O_7.5\frac{1}{2}H_2O$

Citrate

$t$ = 25° (124)

| | | |
|---|---|---|
| $Na_3C_6H_5O_7.5\frac{1}{2}H_2O$ | | |
| 0.0 | 48.10 | 1.2760 |
| 8.9 | 38.90 | |

### C = $Na_3C_6H_5O_7.5\frac{1}{2}H_2O$.—(*Continued*)

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| $Na_3C_6H_5O_7.5\frac{1}{2}H_2O$ | | |
| 17.0 | 29.30 | 1.1290 |
| 26.4 | 15.70 | 1.0370 |
| 41.7 | 3.70 | 0.9473 |
| 51.0 | 1.35 | 0.9166 |
| 70.2 | 0.09 | 0.8654 |
| 99.9 | | 0.7894 |

### C = $NaC_6H_5SO_4.2H_2O$

*p*-Phenolsulfonate

$t$ = 25° (124)

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| $NaC_6H_5SO_4.2H_2O$ | | |
| 0.0 | 19.38 | 1.079 |
| 8.9 | 17.46 | 1.057 |
| 17.0 | 15.98 | 1.038 |
| 26.4 | 14.47 | 1.016 |
| 51.0 | 9.5 | 0.952 |
| 70.2 | 5.03 | 0.886 |
| 89.6 | 1.16 | 0.821 |
| 99.9 | 1.49* | |

* C became opaque.

### C = $NaC_6H_4NO_3$

*p*-Nitrophenate

$t$ = 25° (38)

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| $NaC_6H_4NO_3.4H_2O$ | |
| 0 | 56.35 |
| 10 | 51.50 |
| 15 | 50.07 |
| 30 | 51.84 |
| 40 | 53.44 |
| 45 | 52.97 |
| $NaC_6H_4NO_3.2H_2O$ | |
| 0 | 56.40 |
| 10 | 51.68 |
| 15 | 50.19 |
| 20 | 50.07 |
| 25 | 50.88 |
| 30 | 51.56 |
| 35 | 52.81 |
| 40 | 53.44 |
| 45 | 53.13 |
| 50 | 52.00 |
| 60 | 47.49 |
| 65 | 43.78 |
| 70 | 38.95 |
| 80 | 27.53 |
| 85 | 20.45 |
| 90 | 14.95 |
| 95 | 12.56 |
| 100 | 44.12 |

### C = $NaC_6H_3NClO_3$

2-Nitro-4-chlorophenate

$t$ = 25° (38)

| | |
|---|---|
| $NaC_6H_3NClO_3.H_2O$ | |
| 0 | 27.02 |
| 10 | 23.74 |
| 20 | 23.14 |
| 25 | 24.04 |
| 30 | 25.76 |
| 35 | 27.08 |

### C = $NaC_6H_3NClO_3$.—(*Cont'd*)

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| $NaC_6H_3NClO_3.H_2O$ | |
| 40 | 29.90 |
| 45 | 31.90 |
| 50 | 30.68 |
| 55 | 27.24–29.08 |
| 60 | 31.46 |
| 65 | 31.10 |
| 70 | 26.04 |
| 80 | 18.60 |
| 90 | 8.70 |
| 95 | 6.16 |
| 100 | 6.80 |

### C = $NaC_6H_3N_2O_5.H_2O$

2, 4-Dinitrophenate

$t$ = 25° (38)

| | |
|---|---|
| $NaC_6H_3N_2O_5.H_2O$ | |
| 0 | 44.61 |
| 10 | 35.16 |
| 15 | 32.46 |
| 20 | 31.88 |
| 25 | 30.90 |
| 30 | 31.48 |
| 35 | 32.60 |
| 40 | 33.86 |
| 50 | 34.70 |
| 55 | 33.92 |
| 60 | 32.14 |
| 70 | 26.30 |
| 75 | 21.74 |
| 80 | 17.98 |
| 85 | 12.58 |
| 90 | 8.18 |
| 95 | 5.66 |
| 100 | 26.71 |

### C = $NaC_6H_2N_3O_7$

Picrate (38)

| | |
|---|---|
| $NaC_6H_2N_3O_7.H_2O$ | |
| $t$ = 0° | |
| 0 | 18.24 |
| 5 | 14.26 |
| 10 | 11.69 |
| 15 | 9.64 |
| 20 | 8.16 |
| 25 | 7.21 |
| 30 | 7.18 |
| 35 | 7.55 |
| 40 | 8.43 |
| 45 | 10.42 |
| 50 | 11.25 |
| 55 | 12.93 |
| 60 | 12.77 |
| 80 | 8.84 |
| 90 | 5.47 |
| 95 | 4.493 |
| 100 | 2.683 |
| $t$ = 25° | |
| 0 | 42.80 |
| 5 | 37.41 |
| 10 | 33.26 |
| 20 | 28.16 |
| 25 | 27.44 |
| 30 | 27.89 |
| 35 | 29.94 |

### C = $NaC_6H_2N_3O_7$.—(*Cont'd*)

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| $NaC_6H_2N_3O_7.H_2O$ | |
| $t$ = 25° | |
| 40 | 31.45 |
| 45 | 33.13 |
| 50 | 34.09 |
| 60 | 32.45 |
| 65 | 30.47 |
| 70 | 27.77 |
| 80 | 19.48 |
| 85 | 15.37 |
| 90 | 12.47 |
| 95 | 8.73 |
| 100 | 44.38 |

### C = $NaC_7H_5O_2$

Benzoate

$t$ = 25° (124)

| Wt. % B in (A+B) | Wt. % C in soln. | $d^{25}$ soln. |
|---|---|---|
| $NaC_7H_5O_2$ | | |
| 0.0 | 35.99 | 1.155 |
| 8.9 | 35.53 | 1.137 |
| 32.0 | 31.74 | 1.082 |
| 51.0 | 25.43 | 1.016 |
| 70.2 | 15.25 | 0.927 |
| 91.4 | 2.25 | 0.825 |
| 96.3 | 1.05 | 0.807 |
| 99.9 | 0.58 | 0.795 |

### C = $NaC_7H_5O_3$

Salicylate

$t$ = 25° (124)

| | | |
|---|---|---|
| $NaC_7H_5O_3$ | | |
| 0.0 | 53.56 | 1.252 |
| 8.9 | 52.10 | |
| 32.4 | 47.40 | 1.169 |
| 51.6 | 41.93 | 1.102 |
| 71.5 | 32.10 | 1.010 |
| 92.6 | 11.75 | 0.864 |
| 96.6 | 6.56 | 0.828 |
| 99.9 | 3.82 | 0.805 |

### C = $Na_3C_9H_5S_2O_8$

Disulfocinnamate (86)

| $t$° | Vol. % B in (A+B) | Wt. % C in soln. |
|---|---|---|
| | $Na_3C_9H_5S_2O_8$ | |
| Room | 40 | 6 |
| B. P. | 40 | 23 |

### C = KF

$t$ = 23–25° (44)

| Wt. % B in (A + B) | g C/kg (A + B) |
|---|---|
| KF | |
| 99.6 | 47.9 |
| $KF + KF.2H_2O$ | |
| 97.5 | 15.41 |
| $KF.2H_2O$ | |
| 84 | 11.7 |

### C = KCl

| Mol B/kg A | g C/kg A |
|---|---|
| KCl | |
| $t$ = 0° (5) | |
| 0 | 285.2 |
| 0.25 | 278 0 |

**$C_2H_6O$.—(*Continued*)**

**C = KCl.—(*Continued*)**

| Mol B/kg A | g C/kg A |
|---|---|
| KCl | |
| $t = 0°$ (5) | |
| 0.50 | 271.1 |
| 1.0 | 256.5 |
| 3.0 | 208.8 |
| $t = 25°$ (4) | |
| 0 | 359.7 |
| 0.25 | 353.8 |
| 0.50 | 346.2 |
| 1.0 | 333.8 |
| 2.0 | 315.6 |
| 5.0 | 258.9 |

**C = $KClO_4$**

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| $t = 14°$ (103) | |
| $KClO_4$ | |
| 94.7 | 0.15 |
| 58.5 | 2.6 |
| 42.4 | 3.9 |
| 27.3 | 5.7 |
| 13.2 | 7.8 |
| 7.1 | 9.2 |
| 0 | 12.4 |

| Vol. % B in (A + B) | g C/kg (A + B) |
|---|---|
| $t = 25.00°$ (39) | |
| $KClO_4$ | |
| 50 | 7.90 |
| 75 | 3.13 |

| Vol. % B in (A + B) | g C/kg soln. |
|---|---|
| $t = 25.2°$ (136) | |
| $KClO_4$ | |
| 0 | 20.85 |
| 51.2 | 7.54 |
| 93.5 | 0.51 |
| 98.8 | 0.19 |

| Vol. % B in (A + B) | g C/kg (A + B) |
|---|---|
| $t = 40.00°$ (39) | |
| $KClO_4$ | |
| 50 | 14.22 |
| 75 | 5.48 |

**C = KBr**

| Mol B/kg A | g C/kg A |
|---|---|
| KBr | |
| $t = 0°$ (5) | |
| 0.0 | 536.8 |
| 0.25 | 529.3 |
| 0.50 | 502.9 |
| 1.0 | 491.8 |
| 3.0 | 455.3 |
| $t = 25°$ (4) | |
| 0.0 | 688.4 |
| 0.25 | 683.9 |
| 0.50 | 669.3 |
| 1.0 | 652.2 |
| 3.0 | 591.3 |
| 5.0 | 549.9 |

**C = KI**

| Mol B/kg A | g C/kg A |
|---|---|
| $t = 25°$ (4) | |
| KI | |
| 0.0 | 1487.9 |
| 0.25 | 1481.4 |
| 0.50 | 1471.0 |
| 1.0 | 1449.3 |
| 3.0 | 1383.7 |
| 5.0 | 1337.1 |

**C = $K_2SO_4$**

| | |
|---|---|
| $t = 25°$ (5) | |
| $K_2SO_4$ | |
| 0 | 122.5 |
| 1.0 | 86.75 |

| B | C |
|---|---|
| $t = 25°$ (42) | |
| Wt. % soln. | |
| $K_2SO_4$ | |
| 1.35 | 9.17 |
| 4.80 | 6.90 |
| 7.80 | 4.96 |
| 9.70 | 4.32 |
| 12.34 | 3.57 |
| 14.51 | 2.71 |
| 15.26 | 2.66 |
| 20.50 | 1.83 |
| 26.91 | 0.97 |
| 35.97 | 0.41 |
| 43.90 | 0.22 |
| 69.26 | 0.016 |

**C = $KNO_3$**

| Mol B/kg A | g C/kg A |
|---|---|
| $t = 25°$ (5) | |
| $KNO_3$ | |
| 0 | 384.5 |
| 0.25 | 368.3 |
| 0.50 | 354.4 |
| 1.0 | 327.0 |

**C = $K_2CO_3$**

| Wt. % B in (A + B) | g C/kg (A + B) |
|---|---|
| $t = 23$–$25°$ (44) | |
| $K_2CO_3$ | |
| 99.6 | 16.3 |
| $2K_2CO_3.3H_2O$ | |
| 97.5 | 0.54 |

**C = $KC_2H_3O_2$**
Acetate

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| $t = 25°$ (124) | | |
| $KC_2H_3O_2$ | | |
| 0.0 | 68.73 | 1.417 |
| 32.0 | 67.74 | 1.336 |
| 51.0 | 62.50 | 1.255 |
| 70.2 | 55.30 | 1.154 |
| 89.6 | 35.70 | 0.997 |
| 96.2 | 22.90 | 0.909 |
| 99.9 | 14.50 | 0.857 |

**C = $K_2C_4H_4O_6.\frac{1}{2}H_2O$**
Tartrate

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| $t = 18°$ (101) | |
| $K_2C_4H_4O_6.\frac{1}{2}H_2O$ | |
| 0 | 4.903 |
| 50 | 3.582 |
| 80 | 2.935 |
| 100 | 2.566 |

**C = $KHC_4H_4O_6$**
Bitartrate

| | |
|---|---|
| $t = 14°$ (103) | |
| $KHC_4H_4O_6$ | |
| 94.7 | 0.05 |
| 58.5 | 0.2 |
| 42.4 | 0.42 |
| 27.3 | 0.77 |
| 15.9 | 1.5 |
| 8.7 | 2.2 |
| 0 | 4.8 |

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| $t = 25°$ (124) | | |
| $KHC_4H_4O_6$ | | |
| 0.0 | 0.649 | 1.002 |
| 8.9 | 0.382 | 0.986 |
| 17.0 | 0.242 | 0.975 |
| 26.4 | 0.157 | 0.961 |
| 51.0 | 0.062 | 0.911 |
| 89.6 | 0.018 | 0.816 |
| 99.9 | 0.010 | 0.789 |

**C = $KSbOC_4H_4O_6.\frac{1}{2}H_2O$**
Tartar emetic

| | | |
|---|---|---|
| $t = 25°$ (124) | | |
| $KSbOC_4H_4O_6.\frac{1}{2}H_2O$ | | |
| 0 | 7.85 | 1.052 |
| 8.9 | 4.20 | 1.011 |
| 17.0 | 2.49 | 0.988 |
| 26.4 | 1.16 | 0.966 |
| 51.0 | 0.22 | 0.911 |
| 70.2 | 0.06 | 0.865 |
| 89.6 | Tr. | 0.816 |
| 99.9 | Tr. | 0.788 |

**C = $K_3C_6H_5O_7.H_2O$**
Citrate

| | | |
|---|---|---|
| $t = 25°$ (124) | | |
| $K_3C_6H_5O_7.H_2O$ | | |
| 0 | 64.50 | 1.5180 |
| Upper layer | | |
| 32.0 | 0.2 | |
| 51.0 | 0.38 | |
| 70.2 | 0.10 | 0.8366 |
| Lower layer | | |
| 8.9 | 60.00 | 1.4920 |
| 32.0 | 61.60 | 1.4930 |
| 51.0 | 62.50 | |
| 70.2 | 62.30 | |
| One liquid phase | | |
| 81.4 | 0.038 | 0.8356 |
| 91.6 | 0.016 | 0.8139 |
| 99.9 | 0.014 | 0.7896 |

**C = $KC_6H_2N_3O_7$**
Picrate

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| $KC_6H_2N_3O_7$ | |
| 0 | 6.45 |
| 10 | 5.59 |
| 15 | 4.75 |
| 20 | 4.50 |
| 25 | 4.53 |
| 30 | 4.72 |
| 35 | 4.84 |
| 40 | 5.33 |
| 45 | 5.60 |
| 50 | 5.82 |
| 55 | 5.98 |
| 60 | 5.74 |
| 65 | 5.46 |
| 70 | 4.85 |
| 75 | 4.10 |
| 80 | 3.26 |
| 85 | 2.27 |
| 90 | 1.74 |
| 95 | 1.00 |
| 100 | 1.84? |

**C = $K_2SiF_6$**

| | |
|---|---|
| $t = 14°$ (103) | |
| $K_2SiF_6$ | |
| 94.7 | 0.0096 |
| 42.4 | 0.05 |
| 27.3 | 0.09 |
| 15.9 | 0.21 |
| 8.7 | 0.46 |
| 0 | 0.9 |

**C = $K_2PtCl_6$**

| | |
|---|---|
| $t = 14°$ (103) | |
| $K_2PtCl_6$ | |
| 94.7 | 0.05 |
| 58.5 | 0.2 |
| 42.4 | 0.5 |
| 27.3 | 1.4 |
| 15.9 | 2.6 |
| 8.7 | 4.2 |
| 0 | 9.3 |

**C = $K_3Co(NO_2)_6.1\frac{1}{2}H_2O$**

| | |
|---|---|
| $t = 14°$ (103) | |
| $K_3Co(NO_2)_6.1\frac{1}{2}H_2O$ | |
| 94.7 | 0.026 |
| 42.4 | 0.033 |
| 27.3 | 0.036 |
| 15.9 | 0.056 |
| 8.7 | 0.09 |
| 0 | 0.21 |

**C = $KNaC_4H_4O_6$**
Tartrate

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| $t = 25°$ (124) | | |
| $KNaC_4H_4O_6$ | | |
| 0.0 | 53.33 | 1.310 |
| 8.9 | 43.26 | 1.229 |
| 17.0 | 31.49 | 1.152 |
| 26.4 | 17.63 | 1.065 |

C = $KNaC_4H_4O_6$.—(*Cont'd*)

| Wt. % B in (A+B) | Wt. % C in soln. | $d_4^{25}$ soln. |
|---|---|---|
| $KNaC_4H_4O_6$ | | |
| 41.7 | 5.09 | 0.955 |
| 51.0 | 2.20 | 0.922 |
| 81.5 | 0.04 | 0.838 |
| 99.9 | Tr. | 0.789 |

C = $RbClO_4$ (39)

| Vol. % B in (A+B) | g C/kg (A + B) 25° | 40° |
|---|---|---|
| $RbClO_4$ | | |
| 50 | 5.20 | 9.54 |
| 75 | 2.04 | 3.70 |

C = $CsClO_4$ (39)

| 25° | 40° |
|---|---|
| $CsClO_4$ | |
| 8.79 | 15.22 |
| 3.65 | 6.35 |

C = $CsGa(SO_4)_2.12H_2O$
$t$ = 25° (29)

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| $CsGa(SO_4)_2.12H_2O$ | |
| 0 | 15.1 |
| 50 | 0.0387 |
| 70 | 0.0356 |

C = Soaps, *r.* (137)

$C_2H_6O_2$
Ethylene glycol
C = $K_2SO_4$
$t$ = 25° (42)
Wt. % soln.

| B | C |
|---|---|
| $K_2SO_4$ | |
| 3.16 | 9.67 |
| 9.78 | 7.69 |
| 18.47 | 5.74 |
| 32.11 | 3.57 |
| 49.03 | 1.83 |

$C_3H_4O_4$
Malonic acid
C = $C_7H_5NO_4$
*o*-Nitrobenzoic acid
$t$ = 25° (74)
Mol/l soln.

| B | C |
|---|---|
| $C_7H_5NO_4$ | |
| 0.03126 | 0.0428 |
| 0.1009 | 0.04153 |
| 0.2004 | 0.03967 |

C = $C_7H_6O_3$
Salicylic acid
$t$ = 25° (74)

| $C_7H_6O_3$ | |
|---|---|
| 0.03126 | 0.01485 |
| 0.1009 | 0.01408 |
| 0.2004 | 0.01362 |

$C_3H_5IO_2$
$\beta$-Iodopropionic acid
C = $NaC_3H_4IO_2$
$\beta$-Iodopropionate
$t$ = 25° (127)

| Mol B/l soln. | Mol C/l (A+B) |
|---|---|
| $C_3H_5IO_2$ | |
| 0.040 | 0 |
| 0.63 | 1.0 |

$C_3H_6O$
Acetone
C = $C_{12}H_{22}O_{11}$, Sucrose
*See also* Vol. III, p. 401
$t$ = 25° (85)
Wt. % aqueous sugar soln.

| B | C |
|---|---|
| 582 | 10 |
| 250 | 20 |
| 150 | 30 |
| 92.8 | 40 |
| 48.1 | 50 |
| 24.2 | 60 |
| 12.8 | 70 |

C = $CuCl_2$
$t$ = 30° (69)
Wt. % soln.

| B | C |
|---|---|
| $CuCl_2.2H_2O$ | |
| 0.0 | 43.95 |
| 5.00 | 41.00 |
| 13.16 | 37.47 |
| 19.10 | 35.58 |
| 32.90 | 29.18 |
| 42.50 | 26.20 |
| 49.03 | 22.90 |
| 67.43 | 14.97 |
| 76.40 | 11.80 |
| 82.20 | 9.77 |
| 92.98 | 4.70 |
| $CuCl_2.2C_3H_6O$ | |
| 98.97 | 1.03 |

C = $CaCl_2$ (69); *cf.* (43)
$t$ = 0°

| $CaCl_2.6H_2O$ | |
|---|---|
| 0.0 | 37.3 |
| 10.3 | 33.9 |
| 16.6 | 32.3 |
| 18.9 | 31.2 |
| 27.0 | 30.6 |
| 28.45 | 30.45 |
| Aqueous layer | |
| 30.27 | 30.55 |
| 29.3 | 27.53 |
| 31.6 | 18.12 |
| 41.6 | 10.10 |
| 65 | 3* |
| Acetone layer | |
| 65 | 3* |
| 84.2 | 0.10 |
| 93.1 | 0.04 |
| 98.3 | 0.01 |
| 99.9 | 0.0 |

C = $CaCl_2$.—(*Continued*)
Wt. % soln.

| B | C |
|---|---|
| $t$ = 28° | |
| $CaCl_2.6H_2O$ | |
| 0.0 | 46.1 |
| 5.9 | 45.9 |
| $CaCl_2.6H_2O$ + $CaCl_2.4H_2O$ | |
| 10.8 | 44.4 |
| $CaCl_2.4H_2O$ | |
| 13.4 | 44.4 |
| 15.0 | 43.9 |
| $CaCl_2.4H_2O$ + $CaCl_2.3C_3H_6O$ | |
| 15.3 | 44.2 |
| $CaCl_2.3C_3H_6O$ | |
| 15.7 | 42.9 |
| 20.5 | 40.5 |
| 21.1 | 40.4 |
| Aqueous layer | |
| 21.03 | 40.30 |
| 19.85 | 34.38 |
| 19.08 | 29.99 |
| 19.97 | 25.63 |
| 21.76 | 21.77 |
| 26.45 | 16.60 |
| 41.50 | 9.58 |
| 47.60 | 7.33 |
| 61.50* | 3.50* |
| Acetone layer | |
| 61.50* | 3.50* |
| 73.50 | 1.31 |
| 77.50 | 0.18 |
| 89.20 | 0.04 |
| 92.35 | 0.01 |
| 99.30 | 0.01 |
| 99.90 | 0.0 |

* Critical solution, composition by extrapolation.

C = $BaCl_2$
$t$ = 18° (69)

| $BaCl_2.2H_2O$ | |
|---|---|
| 0.0 | 26.04 |
| 9.3 | 21.20 |
| 15.1 | 17.69 |
| 33.3 | 9.75 |
| 41.3 | 7.18 |
| 60.0 | 3.28 |
| 73.7 | 2.40 |
| 98.8 | 0.01 |

C = $Li_2SO_4$
$t$ = 28° (69)

| $Li_2SO_4.H_2O$ | |
|---|---|
| 0 | 25.20 |
| 4.90 | 21.00 |
| Aqueous layer | |
| 7.38 | 19.65 |
| 11.80 | 16.10 |
| 15.70 | 13.20 |
| 27* | 8* |
| Acetone layer | |
| 27* | 8* |
| 39.65 | 19.65 |
| 48.50 | 2.00 |
| 56.10 | 0.90 |
| One liquid phase | |
| 63.4 | 0.6 |

C = $Li_2SO_4$.—(*Continued*)
Limiting conjugate solutions

| $t$° | Wt. % soln. B | C |
|---|---|---|
| Aqueous layer | | |
| 35 | 6.75 | 19.90 |
| 28 | 7.38 | 19.65 |
| 18 | 7.34 | 19.68 |
| 0 | 8.70 | 19.05 |
| Acetone layer | | |
| 35 | 58.4 | 0.76 |
| 28 | 56.1 | 0.90 |
| 18 | 53.5 | 1.42 |
| 0 | 43.5 | 3.00 |

* Critical soln. Inferior critical temperature at −20°.

C = NaCl
$t$ = 20° (69); *cf.* (43)

| Vol. % B in (A + B) | Mol C/l soln |
|---|---|
| NaCl | |
| One liquid phase | |
| 0 | 5.379 |
| 10 | 4.646 |
| 20 | 3.948 |
| 30 | 3.301 |
| Two liquid phases | |
| 32 | 3.085 |
| 87 | 0.077 |
| One liquid phase | |
| 88 | 0.073 |
| 89 | 0.056 |
| 90 | 0.042 |

$t$ = 25°
Wt. % soln.

| B | C |
|---|---|
| NaCl | |
| 0.0 | 26.60 |
| 8.6 | 22.66 |
| 13.9 | 20.38 |
| Aqueous layer | |
| 20.4* | 17.58 |
| 22.6 | 16.20 |
| 28.3 | 12.97 |
| 40.8 | 8.60 |
| 54.5† | 5.5† |
| Acetone layer | |
| 54.5† | 5.5† |
| 66.8 | 2.61 |
| 76.4 | 0.98 |
| 81.7 | 0.57 |
| 84.1* | 0.44* |
| One liquid phase | |
| 89.6 | 0.30 |
| 100 | 0.00 |

* Limiting conjugate layers.
† Critical solution.

C = NaI, *v.* (89)

C = $Na_2SO_4$ (69)
$t$ = 28°

| $Na_2SO_4.10H_2O$ | |
|---|---|
| 0 | 25.80 |
| 4.4 | 20 30 |

### $C_3H_6O$.—(*Continued*)

C = $Na_2SO_4$.—(*Continued*)

Wt. % soln.

| B | C |
|---|---|
| $Na_2SO_4.10H_2O$ | |
| 8.3 | 15.80 |
| 10.3 | 14.20 |
| 24.7 | 4.59 |
| 33.6 | 2.11 |
| 47.0 | 0.15 |
| 55.0 | 0.13 |
| $Na_2SO_4.10H_2O + Na_2SO_4$ | |
| 88.1 | 0.01 |
| $Na_2SO_4$ | |
| 94.0 | 0.00 |
| $t = 31°$ | |
| $Na_2SO_4.10H_2O$ | |
| 0.0 | 29.70 |
| Aqueous layer | |
| 2.6 | 27.37 |
| 3.1 | 26.20 |
| 7.5 | 20.40 |
| 17* | 12* |
| Acetone layer | |
| 17* | 12* |
| 30.0 | 4.50 |
| 37.1 | 2.00 |
| 39.0 | 1.82 |
| One liquid phase | |
| 40.0 | 1.70 |
| $Na_2SO_4$ | |
| 84.1 | 0.02 |
| $t = 35°$ | |
| $Na_2SO_4$ | |
| 0 | 33.1 |
| Aqueous layer | |
| 1.78 | 28.90 |
| 3.50 | 25.20 |
| 4.65 | 23.23 |
| 10.60 | 17.00 |
| 16* | 12* |
| Acetone layer | |
| 16* | 12* |
| 22.3 | 7.71 |
| 32.4 | 3.51 |
| 36.2 | 2.44 |
| 45.1 | 1.15 |
| One liquid phase | |
| 65.60 | 0.09 |

Limiting conjugate layers

| $t°$ | Wt. % soln. B | Wt. % soln. C |
|---|---|---|
| Aqueous layer | | |
| | $Na_2SO_4$ | |
| 50 | 3.90 | 26.26 |
| 40 | 2.80 | 28.06 |
| 35 | 1.78 | 28.90 |
| | $Na_2SO_4 + Na_2SO_4.10H_2O$ | |
| 32 | 1.74 | 29.54 |
| | $Na_2SO_4.10H_2O$ | |
| 31 | 2.60 | 27.37 |
| 30 | 6.20 | 21.20 |
| 29.6* | 12* | 13* |

C = $Na_2SO_4$.—(*Continued*)

| $t°$ | Wt. % soln. B | Wt. % soln. C |
|---|---|---|
| Acetone layer | | |
| | $Na_2SO_4$ | |
| 50 | 46.3 | 1.09 |
| 40 | 45.2 | 1.11 |
| 35 | 45.1 | 1.15 |
| | $Na_2SO_4 + Na_2SO_4.10H_2O$ | |
| 32 | 45.1 | 1.06 |
| | $Na_2SO_4.10H_2O$ | |
| 31 | 39.0 | 1.82 |
| 30 | 26.0 | 5.53 |
| 29.6* | 12* | 13* |

* Critical solution.

C = $NaNO_3$ (69)

| Wt. % A in (A + B) | Wt. % C in soln. |
|---|---|
| One liquid phase | |
| | $NaNO_3$ |
| | $t = 30°$ |
| 100 | 49.10 |
| 95 | 46.96 |
| 90.91 | 45.11 |
| 80 | 40.10 |
| 70 | 35.08 |
| 60 | 29.80 |
| 50 | 24.34 |
| 40 | 18.55 |
| 30 | 11.35 |
| 20 | 7.10 |
| 10 | 1.89 |
| | $t = 40°$ |
| 100 | 51.1 |
| 91.53 | 47.7 |
| 83.19 | 43.9 |
| 74.81 | 39.9 |
| 65.71 | 36.7 |
| 55.89 | 31.6 |
| 46.10 | 24.7 |
| 35.18 | 18.7 |
| 24.03 | 9.8 |
| 12.38 | 3.1 |

$t = 43.5°$

Wt. % soln.

| B | C |
|---|---|
| $NaNO_3$ | |
| 0 | 52.30 |
| 4.9 | 48.15 |
| 15.5 | 40.0 |
| 24.8 | 33.90 |
| Aqueous layer | |
| 34.4 | 27.55 |
| 41.1 | 23.30 |
| Acetone layer | |
| 65.1 | 10.60 |
| 72.8 | 8.06 |

Critical temperature = 41.3°.

C = $NaC_6H_3N_2O_5.H_2O$

Dinitrophenate

$t = 25°$ (38)

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| $NaC_6H_3N_2O_5.H_2O$ | |
| 0 | 44.61 |
| 10 | 48.59 |
| 20 | 54.70 |
| 30 | 60.86 |
| 40 | 68.50 |
| 50 | 74.42 |
| 60 | 77.84 |
| 70 | 75.68 |
| 80 | 65.36 |
| 90 | 43.56 |
| 100 | 10.85 |

C = KF

$t = 20°$ (43)

Wt. % soln.

| B | C |
|---|---|
| $KF.2H_2O$ | |
| 1.42 | 32.58 |
| 5.81 | 20.19 |
| 9.87 | 16.13 |
| 11.81 | 14.69 |
| 17.57 | 11.43 |
| 17.81 | 11.19 |
| 22.48 | 9.52 |
| 25.38 | 8.62 |
| 28.41 | 7.59 |
| 28.53 | 7.47 |

C = $K_2SO_4$

$t$ = room (42)

| $K_2SO_4$ | |
|---|---|
| 4.92 | 7.20 |
| 10.06 | 5.02 |
| 16.23 | 2.96 |
| 24.31 | 1.50 |
| 37.19 | 0.47 |
| 46.29 | 0.20 |
| 62.40 | 0.03 |

C = $K_2CO_3$

$t = 20°$ (43)

| $2K_2CO_3.3H_2O$ | |
|---|---|
| 32.0 | 6.67 |
| 32.5 | 6.02 |
| 40.0 | 3.51 |
| 42.10 | 2.92 |
| 44.87 | 2.38 |
| 48.70 | 1.72 |
| 48.97 | 1.59 |
| 52.11 | 1.21 |
| 55.67 | 1.11 |
| 64.0 | 0.7 |

C = $KC_6H_2N_3O_7$

Picrate

$t = 25°$ (38)

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| $KC_6H_2N_3O_7$ | |
| 0 | 6.45 |
| 10 | 7.26 |
| 20 | 8.76 |

C = $KC_6H_2N_3O_7$.—(*Cont'd*)

| Vol. % B in (A + B) | g C/l soln. |
|---|---|
| $KC_6H_2N_3O_7$ | |
| 30 | 11.40 |
| 40 | 15.55 |
| 50 | 21.06 |
| 60 | 26.15 |
| 70 | 30.90 |
| 80 | 33.40 |
| 90 | 30.84 |
| 100 | 10.80 |

### $C_3H_6O_2$

Propionic acid

C = $C_{10}H_8$

Naphthalene (20)

Wt. % soln.

| B | C |
|---|---|
| $C_{10}H_8$ | |
| $t = 0°$ | |
| 69.1 | 1.5 |
| 78.6 | 3 |
| 86.6 | 6 |
| 89.6 | 9.97 |
| $t = 25°$ | |
| 26.9 | 0.1 |
| 38.1 | 0.3 |
| 49.6 | 0.75 |
| 58.7 | 1.5 |
| 67.3 | 3 |
| 74.3 | 6 |
| 80 | 10.92 |
| 80.4 | 16.3 |
| 78.8 | 20.95 |

C = $AgC_3H_5O_2$

Propionate

$t = 25°$ (81)

| Mol B/l (A + B) | g C/l soln. |
|---|---|
| $AgC_3H_5O_2$ | |
| 0 | 9.04 |
| 1.00 | 8.58 |
| 2.00 | 8.01 |
| 2.97 | 7.60 |
| 4.95 | 6.78 |
| 6.97 | 5.78 |
| 8.56 | 4.96 |
| 11.40 | 3.16 |
| 13.03 | 2.17 |

### $C_3H_8O$

Propyl alcohol

C = $C_{10}H_8$

Naphthalene (20)

Wt. % soln.

| B | C |
|---|---|
| $C_{10}H_8$ | |
| $t = 0°$ | |
| 23.7 | 0.105 |
| 27.4 | 0.214 |
| 33.7 | 0.432 |
| 45.1 | 1.110 |

C = $C_{10}H_8$.—(*Continued*)

Wt. % soln.

| B | C |
|---|---|
| $C_{10}H_8$ | |
| $t$ = 25° | |
| 58.8 | 2.28 |
| 69.7 | 3.61 |
| 80.4 | 5.81 |
| 85.5 | 7.84 |

C = NaCl (5)

| Mol B/kg A | g C/kg A | |
|---|---|---|
| | 0° | 25° |
| | NaCl | |
| 0 | 357.8 | 363.0 |
| 0.25 | 351.2 | 355.8 |
| 0.50 | 345.6 | 350.2 |

C = KCl (5)

| | 0° | 25° |
|---|---|---|
| | KCl | |
| 0 | 283.6 | 365.1 |
| 0.25 | 274.1 | 355.4 |
| 0.50 | 265.5 | 347.7 |
| 1.0 | 248.0 | 331.5 |

$C_3H_8O_3$

Glycerol

C = $HgCl_2$

$t$ = 25° (97)

| % B in (A + B) | g C/kg soln. |
|---|---|
| | $HgCl_2$ |
| 0 | 67.6 |
| 5.08 | 72.0 |
| 15.10 | 83.3 |
| 25 | 97.2 |
| 35 | 111.0 |
| 50.18 | 148.8 |
| 75.05 | 265.3 |
| 100 | 442.3 |

C = $Al(NH_4)(SO_4)_2.12H_2O$ (31)

C = $Ca(OH)_2$

$t$ = 25° (18)

| Wt. % soln. | | $d_4^{25}$ |
|---|---|---|
| B | C | soln. |
| $Ca(OH)_2$ | | |
| 0 | 0.117 | |
| 3.50 | 0.178 | 1.008 |
| 15.59 | 0.413 | |
| 17.84 | 0.48 | 1.042 |
| 34.32 | 0.88 | 1.088 |
| 55.04 | 1.34 | 1.149 |

C = $K_2SO_4$

$t$ = 25° (42)

Wt. % soln.

| B | C |
|---|---|
| $K_2SO_4$ | |
| 8.96 | 8.87 |
| 13.36 | 7.69 |
| 20.34 | 6.47 |
| 24.15 | 5.83 |
| 33.73 | 4.44 |
| 40.40 | 3.65 |
| 43.52 | 3.38 |
| 50.18 | 2.69 |

C = $K_2SO_4$.—(*Continued*)

Wt. % soln.

| B | C |
|---|---|
| $K_2SO_4$ | |
| 57.22 | 2.07 |
| 67.94 | 1.53 |
| 78.18 | 0.98 |
| 98.28 | 0.73 |

C = Alkaloids, *v.* (9)

$C_4H_4N_2$

Succinonitrile

C = $C_4H_{10}O$

Ethyl ether (116)

| $t$° | Mol % soln. | | |
|---|---|---|---|
| | A | B | C |
| One liquid phase | | | |
| Ice + $C_4H_4N_2$ | | | |
| Ether layer | | | |
| −16 | 4.4 | 2.9 | 92.7 |
| Aqueous layer | | | |
| − 4.5 | 95.5 | 1.1 | 3.3 |
| − 1.2 | 98.71 | 1.29 | 0 |
| Two liquid phases | | | |
| $C_4H_4N_2$ | | | |
| Ether layer | | | |
| − 4.5 | 6.3 | 3.5 | 90.1 |
| − 2.5 | 6.6 | 4.0 | 89.3 |
| 1–2 | 7.5 | 4.9 | 87.5 |
| Aqueous layer | | | |
| − 4.5 | 95.5 | 1.1 | 3.3 |
| − 2.5 | 95.4 | 1.3 | 3.2 |
| 1–2 | 95.1 | 1.6 | 3.1 |
| Three liquid phases | | | |
| Ether layer | | | |
| 1–2 | 7.5 | 4.0 | 87.5 |
| 10–11 | 8.5 | 5.3 | 86.1 |
| 20–21 | 9.0 | 5.4 | 85.5 |
| 30–31 | 9.4 | 5.4 | 85.0 |
| Aqueous layer | | | |
| 1–2 | 95.1 | 1.6 | 3.1 |
| 10–11 | 95.4 | 2.1 | 2.5 |
| 20–21 | 95.3 | 2.6 | 2.0 |
| 30–31 | 94.6 | 3.6 | 1.8 |
| Nitrile layer | | | |
| 1–2 | 27.9 | 55.6 | 16.4 |
| 10–11 | 30.5 | 52.1 | 17.3 |
| 20–21 | 37.9 | 45.5 | 16.5 |
| 30–31 | 45.1 | 39.5 | 15.3 |

C = $C_7H_6O_2$

Benzoic acid

| $t$° | Mol % soln. | | |
|---|---|---|---|
| | A | B | C |
| One liquid phase | | | |
| $C_7H_6O_2$ + $C_4H_4N_2$ | | | |
| 0 | 98.48 | 1.47 | 0.04 |
| 11–12* | 97.5 | 2.4 | 0.08 |
| 11–12 | 32.0 | 64.9 | 3.1 |
| 24 | 19.6 | 77.4 | 3.0 |
| 34 | 12.9 | 84.2 | 2.9 |
| Two liquid phases | | | |
| Aqueous layer | | | |
| $C_4H_4N_2$ | | | |
| 11–12* | 97.5 | 2.4 | 0.08 |
| 15 | 97.38 | 2.58 | 0.04 |
| 18.5 | 97.5 | 2.5 | 0 |

C = $C_7H_6O_2$.—(*Continued*)

| $t$° | Mol % soln. | | |
|---|---|---|---|
| | A | B | C |
| | $C_7H_6O_2$ | | |
| 24 | 96.86 | 3.02 | 0.126 |
| 35–36 | 95.73 | 3.98 | 0.28 |
| 45–46 | 93.52 | 5.34 | 0.69 |
| 49–50 | 90.03 | 8.51 | 1.46 |
| Nitrile layer | | | |
| | $C_4H_4N_2$ | | |
| 11–12* | 32.0 | 64.9 | 3.1 |
| 15 | 32.5 | 66.2 | 1.3 |
| 18.5 | 28 | 72 | 0 |
| | $C_7H_6O_2$ | | |
| 24 | 43.5 | 52.5 | 4.0 |
| 35–36 | 53.2 | 41.8 | 4.9 |
| 45–46 | 62.1 | 32.5 | 5.4 |
| 50 | 78.0 | 18.2 | 3.8 |
| 51† | 85 | 12.5 | 2.5 |

| Mol % soln. | | |
|---|---|---|
| A | B | C |
| | $C_7H_6O_2$ | |
| | $t$ = 69° | |
| 99.7 | 0 | 0.3 |
| 92.35 | 5.56 | 2.08 |
| 86.41 | 9.40 | 4.19 |
| 80.22 | 13.04 | 6.74 |
| 64.07 | 24.41 | 11.51 |
| 47.61 | 39.73 | 12.66 |
| 0 | 93 | 7 |
| | $t$ = 87° | |
| 99.4 | 0 | 0.61 |
| 97.13 | 1.21 | 1.66 |
| 93.6 | 2.4 | 7.0 |
| 84.93 | 3.35 | 11.71 |
| 72.70 | 6.73 | 20.57 |
| 53.8 | 20.92 | 25.28 |
| 30.41 | 46.67 | 22.61 |
| 0 | 88 | 12 |
| | $t$ = 88 − 89° | |
| 72.5 | 0 | 27.5 |
| 58.79 | 3.67 | 37.53 |
| 48.24 | 11.15 | 40.61 |
| 30.51 | 38.13 | 31.26 |
| 0 | 80.8 | 19.2 |

* Quintuple point. † Critical solution.

$C_4H_2N_2O_4$

Alloxan

C = $C_8H_6N_4O_8$, Alloxantin

$t$ = 25° (12)

Mol/kg $H_2O$

| B | C |
|---|---|
| $C_4H_2N_2O_4$ + $C_8H_6N_4O_8$ | |
| 0.0573 | 0.00269 |
| 0.0407 | 0.00318 |
| 0.0310 | 0.00359 |
| 0.0295 | 0.00364 |
| 0.0276 | 0.00391 |
| 0.0146 | 0.00498 |
| 0.00920 | 0.00598 |
| 0.00703 | 0.00650 |
| 0.00400 | 0.00735 |
| 0.00193 | 0.00812 |
| 0.00161 | 0.00819 |
| 0.00114 | 0.00849 |
| 0.00082 | 0.00869 |

$C_4H_6O_4$

Succinic acid

C = $C_4H_{10}O$

Ethyl ether (142)

Wt. % soln.

| B | C | A | B |
|---|---|---|---|
| Aqueous layer | | Ether layer | |
| | $C_4H_6O_4$ | | |
| | $t$ = 15° | | |
| 5.05 | 0 | 0 | 0.353 |
| 5.11 | 0.34 | 0.03 | 0.39 |
| 5.18 | 1.60 | 0.41 | 0.61 |
| 5.36 | 4.22 | 0.51 | 0.68 |
| 5.44 | 5.37 | 0.76 | 0.86 |
| 5.49 | 5.86 | 1.27 | 1.9 |
| 5.68 | 8.22 | 1.33 | 1.24 |
| 3.47 | 8.25 | 1.41 | 1.29 |
| 3.22 | 8.07 | 1.36 | 1.03 |
| 1.73 | 7.94 | 1.17 | 0.59 |
| 0 | 7.83 | 1.04 | 0 |
| | $t$ = 20° | | |
| 6.30 | 0.0 | 0 | 0.420 |
| 6.39 | 1.00 | 0.30 | 0.60 |
| 6.53 | 2.83 | 0.56 | 0.75 |
| 6.64 | 3.88 | 0.83 | 0.97 |
| 7.01 | 6.77 | 1.12 | 1.20 |
| 7.00 | 6.92 | 1.53 | 1.48 |
| 7.10 | 7.23 | 1.34 | 1.12 |
| 4.88 | 7.16 | 1.40 | 0.86 |
| 3.03 | 7.01 | 1.23 | 0.53 |
| 0 | 6.89 | 1.10 | 0 |
| | $t$ = 25° | | |
| 7.67 | 0 | 0 | 0.487 |
| 7.73 | 0.49 | 0.22 | 0.66 |
| 7.91 | 1.85 | 0.60 | 0.90 |
| 7.95 | 2.10 | 0.62 | 0.91 |
| 7.99 | 3.53 | 0.68 | 0.95 |
| 8.12 | 3.26 | 1.07 | 1.27 |
| 8.21 | 4.02 | 1.24 | 1.34 |
| 8.23 | 3.89 | 1.39 | 1.49 |
| 8.31 | 4.28 | 1.66 | 1.69 |
| 8.49 | 5.49 | 1.53 | 1.21 |
| 8.62 | 6.14 | 1.51 | 1.21 |
| 8.67 | 6.03 | 1.42 | 0.80 |
| 8.76 | 6.56 | 1.41 | 0.79 |
| 6.44 | 6.39 | 1.29 | 0.41 |
| 4.38 | 6.24 | 1.19 | 0 |
| 2.27 | 6.09 | | |
| 0 | 6.00 | | |

C = LiCl; $t$ = 25° (54)

| Mol B/l (A + B) | Mol C/l soln. |
|---|---|
| $C_4H_6O_4$ | |
| 0 | 0.672 |
| 0.18 | 0.60 |
| 0.55 | 0.53 |
| 1.36 | 0.40 |
| 2.76 | 0.25 |
| 4.16 | 0.17 |
| 5.46 | 0.12 |

C = NaCl; $t$ = 25° (54)

| $C_4H_6O_4$ | |
|---|---|
| 0 | 0.672 |
| 0.32 | 0.63 |

### $C_4H_6O_4$.—(*Cont'd*)

C = **NaCl**.—(*Continued*)

| Mol B/l (A + B) | Mol C/l soln. |
|---|---|
| $C_4H_6O_4$ | |
| 0.56 | 0.59 |
| 1.10 | 0.52 |
| 2.26 | 0.41 |
| 4.95 | 0.23 |
| $C_4H_6O_4$ + NaCl | |
| 5.35 | 0.21 |
| NaCl | |
| 5.39 | 0.19 |
| 5.44 | 0.04 |
| 5.46 | 0.0 |

C = $Na_2C_4H_4O_4$
Succinate (90)
D = $C_4H_6O_4.Na_2C_4H_4O_4.6H_2O$
E = $Na_2C_4H_4O_4.6H_2O$
F = $C_4H_6O_4.Na_2C_4H_4O_4$
G = $Na_2C_4H_4O_4.H_2O$

g/kg soln.

| B | C |
|---|---|
| *t* = 0° | |
| B | |
| 26.8 | |
| 47.6 | 32.3 |
| 58.3 | 53.8 |
| B + D | |
| 71.3 | 82.7 |
| D | |
| 62.6 | 86.7 |
| 47.4 | 96.8 |
| 34.9 | 117.4 |
| 23.4 | 156.2 |
| D + E | |
| 19.0 | 183.6 |
| E | |
| 16.7 | 180.7 |
| 9.4 | 178.7 |
| | 176.6 |
| *t* = 25° | |
| B | |
| 71.1 | |
| 102.6 | 36.8 |
| 119.8 | 64.9 |
| 133.5 | 89.9 |
| 155.3 | 126.4 |
| B + D | |
| 169.0 | 152.6 |
| D | |
| 138.3 | 159.7 |
| 119.8 | 165.0 |
| 84.1 | 188.9 |
| 56.5 | 227.1 |
| E | |
| 40.9 | 268.8 |
| 34.6 | 266.9 |
| 23.8 | 265.0 |
| 8.5 | 261.1 |
| | 258.7 |
| *t* = 34.9°* | |
| D + E + F | |
| 56.0 | 308.0 |

### C = $Na_2C_4H_4O_4$.—(*Cont'd*)

g/kg soln.

| B | C |
|---|---|
| *t* = 37.8°* | |
| B + D + F | |
| 254.6 | 196.0 |
| *t* = 38.7° | |
| D + F | |
| 164.5 | 224.8 |
| *t* = 50° | |
| B | |
| 192.7 | |
| 229.0 | 59.5 |
| 253.3 | 102.5 |
| 269.6 | 126.0 |
| 287.3 | 154.9 |
| 309.8 | 189.4 |
| B + F | |
| 317.3 | 196.6 |
| F | |
| 287.1 | 202.2 |
| 265.1 | 207.2 |
| 236.1 | 215.0 |
| 219.8 | 217.0 |
| 184.4 | 225.3 |
| 170.0 | 232.6 |
| 155.7 | 238.0 |
| 130.9 | 255.3 |
| 94.6 | 282.8 |
| 73.8 | 304.8 |
| 42.1 | 369.5 |
| F + E | |
| 42.0 | 373.8 |
| E | |
| 38.8 | 368.5 |
| 26.6 | 366.7 |
| | 363.7 |
| | 365.0 |
| *t* = 63.4°* | |
| E + F + G | |
| 36.5 | 429.3 |
| *t* = 64.9° | |
| E + G | |
| | 455.3 |
| *t* = 75° | |
| B | |
| 376.0 | |
| 403.8 | 82.2 |
| 425.0 | 131.4 |
| 443.8 | 169.3 |
| 454.0 | 187.1 |
| B + F | |
| 459.9 | 195.6 |
| F | |
| 453.2 | 195.2 |
| 423.4 | 203.5 |
| 409.2 | 206.3 |
| 391.8 | 211.0 |
| 356.6 | 218.8 |
| 331.7 | 219.7 |
| 319.5 | 227.6 |
| 321.7 | 219.1 |
| 313.2 | 223.7 |
| 294.0 | 232.8 |
| 268.2 | 243.0 |

### C = $Na_2C_4H_4O_4$.—(*Cont'd*)

g/kg soln.

| B | C |
|---|---|
| F | |
| 205.0 | 263.5 |
| 193.4 | 269.0 |
| 152.8 | 294.5 |
| 77.9 | 361.1 |
| 49.3 | 412.6 |
| F + G | |
| 40.1 | 452.8 |
| G | |
| 31.7 | 453.6 |
| 12.3 | 459.3 |
| | 464.3 |

* Triple point.

### C = KCl

*t* = 25° (54)

| Mol B/l soln. | Mol C/l (A + B) |
|---|---|
| $C_4H_6O_4$ | |
| 0.52 | 3.58 |
| 0.59 | 2.02 |
| 0.63 | 1.04 |
| 0.64 | 0.38 |
| 0.672 | 0 |

### C = KBr

*t* = 25° (54)

| $C_4H_6O_4$ | |
|---|---|
| 0.53 | 4.22 |
| 0.59 | 2.19 |
| 0.64 | 0.55 |

### C = KI

*t* = 25° (54)

| $C_4H_6O_4$ | |
|---|---|
| 0.66 | 0.62 |
| 0.67 | 0.28 |

## $C_4H_6O_5$

Malic acid

C = $Cu(OH)_2$, *v.* (141)

## $C_4H_6O_5$

Acetic anhydride

C = $Na_2O$ (32)
D = $NaC_2H_3O_2.3H_2O$
E = $NaC_2H_3O_2.C_2H_4O_2$
F = $NaC_2H_3O_2.2C_2H_4O_2$
G = $C_2H_4O_2$
H = $NaC_2H_3O_2$

Wt. % soln.

| B | C |
|---|---|
| *t* = 5° | |
| D | |
| 28.41 | 10.14 |
| D + E | |
| 40.24 | 10.08 |
| E | |
| 43.89 | 9.03 |
| 46.38 | 8.88 |
| F | |
| 49.73 | 8.23 |
| 58.83 | 6.72 |
| 75.98 | 4.56 |
| 92.88 | 1.25 |
| *t* = 15° | |
| H | |
| 0.15 | 29.34 |

### C = $Na_2O$.—(*Continued*)

Wt. % soln.

| B | C |
|---|---|
| D | |
| 4.19 | 25.94 |
| 4.88 | 22.24 |
| 12.01 | 15.49 |
| 23.54 | 11.45 |
| D + E | |
| 34.56 | 11.25 |
| E | |
| 39.08 | 10.33 |
| 39.73 | 10.24 |
| 49.32 | 9.16 |
| E + F | |
| 54.34 | 8.56 |
| F | |
| 61.63 | 7.06 |
| 68.81 | 6.17 |
| 70.55 | 5.95 |
| 73.02 | 5.52 |
| 77.60 | 4.84 |
| 84.15 | 3.44 |
| 86.61 | 2.87 |
| 90.56 | 2.16 |
| 95.87 | 1.02 |
| 98.09 | 0.79 |
| *t* = 20° | |
| F | |
| 76.58 | 5.01 |
| 77.33 | 4.89 |
| 80.12 | 4.36 |
| 84.31 | 3.19 |
| 89.75 | 2.10 |
| 89.88 | 1.88 |
| 92.77 | 1.33 |
| *t* = 25° | |
| D | |
| 2.04 | 24.12 |
| 2.52 | 22.55 |
| 3.83 | 19.82 |
| 8.55 | 14.46 |
| 16.56 | 10.07 |
| 40.00 | 9.75 |
| D + E | |
| 41.23 | 9.77 |
| E | |
| 43.94 | 9.04 |
| E + F | |
| 44.80 | 8.96 |
| F | |
| 45.10 | 8.72 |
| 50.03 | 7.83 |
| 55.92 | 7.00 |
| 60.64 | 6.26 |
| 64.79 | 5.66 |
| 71.13 | 4.95 |
| 79.29 | 4.02 |
| 92.29 | 1.05 |
| 93.69 | 0.95 |
| 94.66 | 0.74 |
| 96.16 | 0.57 |
| 97.51 | 0.42 |
| G | |
| 76.42 | 2.01 |
| 76.34 | 2.49 |

C = $Na_2O$.—(*Continued*)

Wt. % soln.

| B | C |
|---|---|
| G | |
| 77.30 | 2.33 |
| 77.67 | 3.48 |
| 90.31 | 1.14 |
| 90.07 | 1.41 |
| 88.97 | 1.84 |
| 87.64 | 2.06 |
| G + F | |
| 87.90 | 2.19 |
| $t$ = 30° | |
| H | |
| 0.77 | 35.31 |
| 8.92 | 26.25 |
| D | |
| 9.06 | 25.98 |
| 13.62 | 18.09 |
| 21.88 | 13.53 |
| D + E | |
| 33.05 | 13.24 |
| E | |
| 32.90 | 13.14 |
| 65.07 | 7.64 |
| E + F | |
| 66.42 | 7.67 |
| F | |
| 69.68 | 7.33 |
| 71.39 | 6.94 |
| 72.85 | 6.61 |
| 77.76 | 5.52 |
| 83.92 | 3.78 |
| 86.73 | 2.94 |
| 94.78 | 1.27 |
| $t$ = 45° | |
| H | |
| 0.77 | 39.82 |
| 2.04 | 32.69 |
| 6.53 | 28.86 |
| 14.29 | 25.58 |
| D | |
| 18.70 | 23.12 |
| 18.85 | 22.46 |
| 19.44 | 21.12 |
| 26.39 | 16.04 |
| D + E | |
| 33.87 | 16.00 |
| E | |
| 36.28 | 14.12 |
| 41.12 | 12.61 |
| 44.85 | 11.81 |
| 51.00 | 10.84 |
| 55.68 | 10.15 |
| 56.37 | 10.32 |
| 61.49 | 9.34 |
| 65.11 | 9.04 |
| 65.74 | 8.86 |
| 68.21 | 8.63 |
| 70.06 | 8.54 |
| 75.06 | 8.20 |
| F | |
| 82.16 | 5.54 |
| 83.64 | 4.64 |
| 85.38 | 4.25 |
| 86.39 | 4.20 |
| 94.23 | 2.36 |

C = $Na_2O$.—(*Continued*)

Wt. % soln.

| B | C |
|---|---|
| E | |
| 97.19 | 1.19 |
| 98.37 | 0.93 |
| $t$ = 60° | |
| H | |
| 0.00 | 46.22 |
| 1.83 | 36.25 |
| 2.07 | 35.55 |
| 2.83 | 34.60 |
| 4.56 | 31.38 |
| 7.96 | 29.31 |
| 14.31 | 26.60 |
| 15.58 | 26.26 |
| 25.73 | 23.90 |
| 36.17 | 21.99 |
| E | |
| 37.41 | 17.75 |
| 49.62 | 12.57 |
| 60.84 | 10.73 |
| 64.23 | 10.27 |
| 66.97 | 9.86 |
| F | |
| 77.83 | 8.31 |
| 84.44 | 6.07 |
| 85.71 | 5.74 |
| E | |
| 90.22 | 4.25 |
| 94.46 | 3.08 |
| $t$ = 75° | |
| H | |
| 0.76 | 44.45 |
| 2.12 | 39.40 |
| 3.24 | 35.37 |
| 5.03 | 32.47 |
| 15.45 | 27.38 |
| 26.47 | 24.48 |
| 36.69 | 22.30 |
| E | |
| 43.06 | 17.85 |
| 56.53 | 12.78 |
| 58.69 | 12.13 |
| 65.71 | 11.05 |
| 68.56 | 10.54 |
| 77.37 | 8.84 |
| 78.28 | 9.02 |
| 78.75 | 8.61 |
| 81.49 | 7.63 |
| 89.61 | 4.09 |
| 90.72 | 3.63 |
| 98.35 | 0.44 |

## $C_4H_6O_6$

*d*-Tartaric acid

C = $HgCl_2$ (97)

$t$ = 25°

| Wt. % B in (A + B) | g C/kg soln. |
|---|---|
| $HgCl_2$ | |
| 10 | 63.6 |
| 20 | 58.0 |
| 25 | 54.2 |
| 35 | 45.8 |
| 42.5 | 39.9 |
| 50 | 33.1 |

C = $H_3BO_3$

$t$ = 25° (56)

Mol/l soln.

| B | C |
|---|---|
| $H_3BO_3$ | |
| 0 | 0.901 |
| 0.75 | 1.000 |
| 1.5 | 1.070 |
| 3.0 | 1.207 |

## $C_4H_6O_6$

*dl*-Tartaric acid

C = $H_3BO_3$

$t$ = 25° (56)

| $H_3BO_3$ | |
|---|---|
| 0.63 | 0.986 |
| 1.26 | 1.046 |
| 2.47 | 1.165 |

## $C_4H_7NO_4$

Aspartic acid

C = Salts

$t$ = 20° (145)

| Salt | g B/l soln. | Mol C/l (A + B) |
|---|---|---|
| $C_4H_7NO_4$* | | |
| $MgCl_2$ | 6.20 | 0.5 |
| $CaCl_2$ | 6.10 | 0.429 |
| | 7.43 | 0.858 |
| | 10.00 | 1.716 |
| $Ca(NO_3)_2$ | 7.55 | 0.49 |
| $SrCl_2$ | 6.46 | 0.5 |
| $SrBr_2$ | 6.48 | 0.486 |
| $Sr(NO_3)_2$ | 6.08 | 0.204 |
| | 7.57 | 0.408 |
| | 9.45 | 0.816 |
| | 13.60 | 1.63 |
| $BaCl_2$ | 7.00 | 0.5 |
| LiCl | 4.88 | 1.17 |
| NaCl | 4.76 | 0.5 |
| | 5.21 | 1.0 |
| | 5.56 | 2.0 |
| | 5.75 | 4.0 |
| KCl | 5.40 | 1.0 |
| KBr | 5.00 | 0.5 |
| | 5.45 | 1.0 |
| | 6.40 | 2.0 |
| | 7.41 | 4.0 |
| KI | 5.65 | 1.0 |
| $K_2SO_4$ | 0.5 | 6.86 |
| $KNO_3$ | 1.0 | 6.33 |
| $KC_2H_3O_2$ | 1.0 | 52.4 |

*Solubility in pure $H_2O$ = 4.10 g/l.

## $C_4H_8O_2$

Butyric acid

C = $C_{10}H_8$

Naphthalene (20)

Wt. % soln.

| B | C | B | C |
|---|---|---|---|
| $t$ = 0° | | $t$ = 25° | |
| $C_{10}H_8$ | | | |
| 75.3 | 4.12 | 55.3 | 4.07 |
| 84.3 | 8.27 | 65.2 | 6.07 |
| 86.9 | 9.67 | 75 | 12.4 |
| | | 76 | 15.5 |
| | | 76.3 | 20.7 |

## $C_4H_{10}O$

Ethyl ether

C = $CdI_2$

$t$ = 12° (140)

| g A/kg B | g C/kg (A + B) |
|---|---|
| $CdI_2$ | |
| 0 | 1.43 |
| 1.0 | 7.8 |
| 3.0 | 20.7 |
| 5.0 | 33.6 |
| 7.0 | 47.7 |
| 9.0 | 64.6 |
| 10.0 | 73.0 |
| 11.0 | 82.7 |
| 11.4* | 86.8 |

*Saturated with $H_2O$.

## $C_4H_{12}IN$

Tetramethylammonium iodide

C = KOH

$t$ = 25° (61)

| g B/l soln. | Mol C/l (A + B) |
|---|---|
| $C_4H_{12}IN$ | |
| 52.72 | 0 |
| 52.30 | 0.057 |
| 51.88 | 0.112 |
| 50.40 | 0.251 |

## $C_5H_5N$

Pyridine

C = $C_{12}H_{22}O_{11}$

Lactose (105)

| Wt. % B in (A+B) | g C/kg (A + B) | |
|---|---|---|
| | $t$ = 1° | $t$ = 25° |
| $C_{12}H_{22}O_{11}$ | | |
| 0 | 192 | 230 |
| 10 | 178 | 224 |
| 20 | 153 | 192 |
| 30 | 129 | 155 |
| 40 | 95 | 106 |
| 50 | 69 | 78 |
| 60 | 46 | 56 |
| 70 | 29 | 32 |
| 80 | 16 | 26 |
| 90 | 18 | 18 |
| 91 | 18 | 18 |
| 100 | 16 | 22 |

C = $C_{18}H_{32}O_{16}$

Raffinose

$t$ = 25° (105)

| Wt. % B in (A + B) | g C/kg (A + B) |
|---|---|
| $C_{18}H_{32}O_{16}$ | |
| 0 | 298 |
| 10 | 231 |
| 20 | 222 |
| 30 | 189 |
| 40 | 134 |
| 50 | 99 |
| 60 | 65 |
| 70 | 53 |
| 80 | 74 |
| 90 | 245 |

### $C_5H_5N$.—(*Continued*)

$C = C_{18}H_{32}O_{16}$.—(*Continued*)

| Wt. % B in (A + B) | g C/kg (A + B) |
|---|---|
| $C_{18}H_{32}O_{16}$ | |
| 91 | 246 |
| 92 | 247 |
| 94 | 369 |
| 96 | 419 |
| 98 | 457 |
| 100 | 791 |

C = Various organic substances, *v.* (28)

### $C = K_2SO_4$

$t = 25°$ (42)

| Wt. % soln. B | C |
|---|---|
| $K_2SO_4$ | |
| 4.23 | 7.95 |
| 13.90 | 4.77 |
| 24.51 | 2.75 |
| 34.19 | 1.47 |
| 46.29 | 0.45 |
| 55.93 | 0.12 |
| 75.90 | 0.006 |

### $C_6H_3N_3O_7$

Picric acid

$C = C_7H_5N_3O_7$

Methylpicric acid (74)

### $C_6H_6$

C = $C_6H_6O$, Phenol (109)

### $C = AgClO_4$

$t = 25°$ (62)

| Wt. % soln. B | C | $d_4^{25}$ soln. |
|---|---|---|
| $AgClO_4.H_2O$ | | |
| 0 | 84.45 | 2.806 |
| 1.19 | 84.28 | 2.823 |
| $AgClO_4.H_2O + AgClO_4.C_6H_6$ | | |
| 1.70 | 84.10 | |
| $AgClO_4.C_6H_6$ | | |
| 1.68 | 83.98 | 2.806 |
| 1.36 | 83.93 | 2.808 |
| 1.55 | 83.12 | 2.747 |
| 1.41 | 81.30 | 2.644 |
| 7.75 | 75.53 | |
| 15.81 | 69.27 | 2.103 |
| 22.32 | 65.69 | 1.978 |
| 27.84 | 62.34 | 1.871 |
| 28.14 | 62.01 | 1.851 |
| 43.18 | 51.89 | 1.562 |
| 50.34 | 46.80 | 1.462 |
| 55.53 | 42.51 | 1.358 |
| 63.52 | 35.20 | 1.254 |
| 67.54 | 31.45 | 1.197 |
| 73.90 | 25.40 | 1.123 |
| 84.29 | 15.37 | 1.021 |
| 85.01 | 14.65 | 1.006 |
| 85.82 | 13.90 | 1.000 |
| 89.13 | 10.65 | |
| 90.26 | 9.55 | 0.949 |
| 90.45 | 9.38 | 0.9474 |
| 90.84 | 9.01 | 0.947 |

### $C = AgClO_4$.—(*Continued*)

| Wt. % soln. B | C | $d_4^{25}$ soln. |
|---|---|---|
| $AgClO_4.C_6H_6$ | | |
| 91.60 | 8.28 | 0.9367 |
| 92.58 | 7.31 | 0.9332 |
| 93.08 | 6.84 | 0.9259 |
| 93.77 | 6.18 | 0.9221 |
| 94.00 | 5.96 | 0.9205 |
| 95.00 | 5.00 | 0.906 |

### $C_6H_6O$

Phenol

### $C = C_6H_6O_3$

Pyrogallol

$t = 20°$ (7)

| Wt. % soln. B | C |
|---|---|
| $C_6H_6O_3$ | |
| 7.9 | |
| 8.5 | 0.8 |
| 9.2 | 1.6 |
| 12.5 | 4.1 |
| 19.2 | 5.3 |
| 24.5 | 5.8 |
| 30.1 | 6.0 |
| 38.7 | 5.9 |
| 43.2 | 5.7 |
| 45.2 | 5.5 |
| 53.1 | 4.8 |
| 61.0 | 3.3 |
| 66.9 | 1.7 |
| 71.4 | |

### $C = C_7H_8O$

*o*-, *m*- or *p*-Cresol (64)

| Wt.% Phenol* | *t* of fusion |
|---|---|
| $C_6H_6O.H_2O$ | |
| 100 | 16.0 |
| 95 | 14.25 |
| 90 | 12.25 |
| 85 | 10.25 |
| 80 | 8.1 |
| 75 | 5.8 |
| 70 | 3.4 |
| 65 | +0.75 |
| 60 | −2.2 |
| 55 | −5.2 |

*$H_2O$ always 9.1 wt.%. All percentages expressed on the phenol-cresol mixture.

### $C = C_8H_6O_4$

Phthalic acid

$t = 25.00°$ (108)

| $C_j$* Rel. solubility | Mol B/1(A + B) |
|---|---|
| $C_8H_6O_4$ | |
| 1.014 | 0.1015 |
| 1.027 | 0.1930 |
| 1.058 | 0.3723 |
| 1.097 | 0.646 |
| 1.143 | 0.946 |
| 1.235 | 1.433 |
| 1.366 | 2.026 |

*Unit of solubility is that in pure water, which = 0.04185 g-Mol/l; ($d_4^{25}$ = 1.0022).

### $C = NaC_{18}H_{33}O_2$

Oleate (7)

| Wt. % soln. B | C |
|---|---|
| $NaC_{18}H_{33}O_2$ | |
| $t = 0°$ | |
| 7.2 | 0 |
| 8.7 | 0.2 |
| 12.1 | 0.8 |
| 16.0 | 1.3 |
| 23.4 | 2.1 |
| 34.8 | 2.9 |
| 58.5 | 4.4 |
| 64.7 | 3.5 |
| 70.4 | 2.0 |
| 74.7 | |
| $t = 20°$ | |
| 7.9 | |
| 9.8 | 0.2 |
| 13.2 | 0.6 |
| 16.5 | 1.0 |
| 22.9 | 1.4 |
| 41.2 | 2.3 |
| 59.7 | 3.1 |
| 62.6 | 2.8 |
| 70.8 | 0.4 |
| 71.4 | |
| $t = 40°$ | |
| 9.4 | |
| 12.8 | 0.2 |
| 16.2 | 0.4 |
| 24.2 | 0.8 |
| 48.4 | 1.8 |
| 50.5 | 1.8 |
| 57.6 | 1.7 |
| 61.0 | 1.3 |
| 64.5 | 0.5 |
| 65.6 | |
| $t = 60°$ | |
| 17.6 | |
| 28.4 | 0.2 |
| 36.7 | 0.1 |
| 53.6 | |

### $C = Ca(OH)_2$

$t = 25°$ (95)

| $C_6H_6O$ | |
|---|---|
| 93.78 | 0 |
| 93.38 | 0.69 |
| $C_6H_6O + Ca(C_6H_5O)_2.3H_2O$ | |
| 93.23 | 1.75 |
| $Ca(C_6H_5O)_2.3H_2O$ | |
| 90.81 | 2.14 |
| 83.51 | 4.68 |
| 74.03 | 6.24 |
| 71.72 | 6.59 |
| 66.69 | 7.53 |
| 61.29 | 7.47 |
| 49.06 | 8.04 |
| 40.69 | 8.36 |
| 37.62 | 8.23 |
| 28.99 | 7.71 |
| 20.18 | 6.92 |
| $Ca(C_6H_5O)_2.3H_2O + Ca(OH)_2$ | |
| 12.05 | 4.74 |

### $C = Ca(OH)_2$.—(*Continued*)

| Wt. % soln. B | C |
|---|---|
| $Ca(OH)_2$ | |
| 9.91 | 4.06 |
| 6.11 | 2.61 |
| 2.05 | 0.93 |
| 0 | 0.12 |

### $C = Sr(OH)_2$

$t = 25°$ (95)

| $C_6H_6O$ | |
|---|---|
| 90.46 | 2.96 |
| 87.42 | 5.32 |
| $C_6H_6O + Sr(C_6H_6O)_2.4H_2O$ | |
| 84.93 | 8.28 |
| $Sr(C_6H_5O)_2.4H_2O$ | |
| 75.71 | 11.55 |
| 57.09 | 13.95 |
| 51.16 | 14.51 |
| 32.14 | 14.66 |
| $Sr(C_6H_5O)_2.4H_2O + Sr(OH)_2.8H_2O$ | |
| 22.52 | 14.75 |
| $Sr(OH)_2.8H_2O$ | |
| 21.10 | 13.79 |
| 19.00 | 12.46 |
| 15.64 | 10.35 |
| 6.14 | 4.59 |
| 2.47 | 2.34 |
| 0 | 1.00 |

### $C = Ba(OH)_2$

$t = 25°$ (95)

| $C_6H_6O$ | |
|---|---|
| 93.78 | 0 |
| 90.81 | 3.69 |
| 88.40 | 5.66 |
| $C_6H_6O + Ba(C_6H_5O)_2.4H_2O$ | |
| 88.46 | 5.74 |
| $Ba(C_6H_5O)_2.4H_2O$ | |
| 88.10 | 5.74 |
| 77.47 | 9.92 |
| 64.92 | 13.26 |
| 48.68 | 15.45 |
| 41.18 | 15.30 |
| 36.68 | 15.10 |
| 18.64 | 13.02 |
| 14.68 | 12.32 |
| 13.16 | 12.46 |
| $Ba(C_6H_5O)_2.4H_2O + Ba(OH)_2.8H_2O$ | |
| 12.63 | 13.65 |
| 12.67 | 13.62 |
| $Ba(OH)_2.8H_2O$ | |
| 10.74 | 12.02 |
| 6.77 | 9.10 |
| 3.62 | 6.74 |
| 0 | 4.54 |

### $C = LiOH$

$t = 25°$ (95)

| $C_6H_6O$ | |
|---|---|
| 93.78 | 0 |
| 93.28 | 0.5$_2$ |

**C = LiOH.**—(*Continued*)

Wt. % soln.

| B | C |
|---|---|
| $C_6H_6O$ + $LiC_6H_5O.2H_2O$ | |
| 92.89 | 0.70 |
| 92.39 | 0.71 |
| $LiC_6H_5O.2H_2O$ | |
| 91.81 | 0.71 |
| 91.62 | 0.79 |
| 84.32 | 1.49 |
| 80.70 | 1.76 |
| 69.16 | 2.53 |
| 60.00 | 2.90 |
| 46.35 | 3.12 |
| 30.16 | 3.28 |
| 11.16 | 3.17 |
| 5.03 | 6.61 |
| $LiC_6H_5O.2H_2O$ + $LiOH.H_2O$ | |
| 2.03 | 10.52 |
| 2.03 | 10.55 |
| $LiOH.H_2O$ | |
| 1.14 | 10.67 |
| 0 | 11.39 |

**C = NaOH**

$t$ = 25° (95)

| $C_6H_6O$ | |
|---|---|
| 92.49 | 1.79 |
| 91.94 | 3.03 |
| $2C_6H_6O.NaC_6H_5O$ | |
| 89.15 | 4.46 |
| 84.36 | 6.70 |
| 78.82 | 9.14 |
| 76.32 | 10.32 |
| 69.53 | 13.33 |
| $NaC_6H_5O.3H_2O$ | |
| 65.18 | 14.51 |
| 62.39 | 15.16 |
| 55.75 | 16.31 |
| 50.73 | 17.43 |
| 42.32 | 18.74 |
| 40.01 | 19.34 |
| 32.34 | 22.54 |
| 23.95 | 25.95 |
| 18.76 | 28.03 |
| 8.14 | 32.63 |
| 2.42 | 40.00 |
| 0.32 | 44.43 |
| $NaOH.H_2O$ | |
| 0 | 53.27 |

**C = KOH**

$t$ = 25° (95)

| $C_6H_6O$ | |
|---|---|
| 92.12 | 0.58 |
| 92.50 | 2.98 |
| $3C_6H_6O.KC_6H_5O$ | |
| 85.04 | 6.14 |
| 80.14 | 7.76 |
| 76.86 | 9.00 |
| 66.25 | 13.08 |
| 59.28 | 20.40 |
| $3C_6H_6O.KC_6H_5O$ + $KC_6H_5O.2H_2O$ | |
| 60.37 | 21.65 |
| $KC_6H_5O.2H_2O$ | |
| 55.10 | 21.74 |
| 50.43 | 22.99 |

**C = KOH.**—(*Continued*)

Wt. % soln.

| B | C |
|---|---|
| $KC_6H_5O.2H_2O$ | |
| 39.85 | 24.62 |
| 27.18 | 28.21 |
| 18.71 | 30.32 |
| 3.50 | 36.24 |
| 0.12 | 52.25 |
| $KOH.2H_2O$ | |
| 0 | 54.34 |

**$C_6H_6O_2$**

Resorcinol

C = $Ba(OH)_2$

$t$ = 25° (95)

| $C_6H_6O_2$ | |
|---|---|
| 65.96 | 0 |
| 63.43 | 8.01 |
| 61.87 | 15.14 |
| 61.47 | 20.90 |
| $BaC_6H_4O_2.2H_2O$ | |
| 31.96 | 34.59 |
| 28.75 | 35.93 |
| $BaC_6H_4O_2.2H_2O$ + $Ba(OH)_2.8H_2O$ | |
| 23.24 | 37.78 |
| $Ba(OH)_2.8H_2O$ | |
| 18.14 | 31.19 |
| 12.89 | 23.03 |
| 10.37 | 19.52 |
| 6.36 | 13.80 |
| 0 | 5.32 |

**C = KOH**

$t$ = 25° (95)

| $C_6H_6O_2$ | |
|---|---|
| 65.96 | 0 |
| 70.40 | 5.00 |
| 75.37 | 9.19 |
| 80.11 | 11.99 |
| $KC_6H_5O_2.2H_2O$ | |
| 64.21 | 22.08 |
| 53.50 | 24.28 |
| 49.66 | 25.52 |
| 42.77 | 28.56 |
| $KC_6H_5O_2.2H_2O$ + $K_2C_6H_4O_2.4H_2O$ | |
| 41.16 | 29.17 |
| 41.10 | 29.20 |
| $K_2C_6H_4O_2.4H_2O$ | |
| 37.47 | 29.64 |
| 32.33 | 30.00 |
| 29.45 | 29.96 |
| 22.31 | 32.30 |
| 13.51 | 36.48 |
| 2.93 | 46.84 |
| 1.38 | 52.38 |
| $K_2C_6H_4O_2.4H_2O$ + KOH? | |
| 1.40 | 56.62 |
| 1.38 | 56.58 |
| KOH? | |
| 1.37 | 56.79 |
| $KOH.H_2O$ | |
| 0.57 | 56.81 |
| 0.31 | 56.70 |
| $KOH.2H_2O$ | |
| 0 | 55.75 |

**$C_6H_7N$**

Aniline

C = $AgClO_4$ (63)

**$C_6H_8O_7$**

Citric acid

C = $C_8H_{10}N_4O_2$

Caffeine (33)

C = $C_{12}H_{22}O_{11}$

Sucrose (83)

C = $HgCl_2$

$t$ = 25° (97)

| Wt. % B in (A + B) | g C/kg soln. |
|---|---|
| $HgCl_2$ | |
| 10 | 66 |
| 25 | 57.8 |
| 50 | 40.7 |

**$C_6H_{12}O_6$**

Glucose

C = NaCl

$t$ = 25° (5); *cf.* (146)

| Mol B/kg A | g C/kg A |
|---|---|
| NaCl | |
| 0 | 361.4 |
| 0.25 | 364.2 |
| 0.50 | 364.3 |
| 1.0 | 369.9 |

C = KCl

$t$ = 25° (5)

| KCl | |
|---|---|
| 0 | 362.7 |
| 0.25 | 366.1 |
| 0.50 | 369.9 |
| 1.0 | 376.3 |
| 3.0 | 402.3 |

**$C_6H_{13}NO_2$**

Leucine

C = Salts

$t$ = 23.7° (123)

| Salt* | g B/l soln. |
|---|---|
| $C_6H_{13}NO_2$† | |
| Ce chloride | 21.56 |
| Mg chloride | 10.69 |
| Ca chloride | 11.49 |
| Sr chloride | 10.87 |
| Ba chloride | 10.32 |
| Li chloride | 9.06 |
| Na chloride | 8.37 |
| Na bromide | 9.03 |
| Na iodide | 9.52 |
| Na sulfate | 7.77 |
| Na nitrate | 9.03 |
| Na formate | 8.53 |
| Na thiocyanate | 10.24 |
| Na acetate | 7.55 |
| Na chloroacetate | 8.04 |
| Na dichloroacetate | 8.15 |
| Na trichloroacetate | 8.67 |
| Na lactate | 7.06 |
| Na malonate | 7.86 |
| Na tartrate | 7.49 |

**C = Salts.**—(*Continued*)

| Salt* | g B/l soln. |
|---|---|
| $C_6H_{13}NO_2$† | |
| Na succinate | 7.56 |
| Na citrate | 8.02 |
| Na benzoate | 8.94 |
| Na salicylate | 10.65 |
| K chloride | 8.57 |

$t$ = 20° (145)

| Salt | Mol C/l (A + B) | g B/kg soln. |
|---|---|---|
| $C_6H_{13}NO_2$‡ | | |
| $CaCl_2$ | 0.297 | 10.85 |
| | 0.594 | 11.62 |
| | 1.18 | 12.81 |
| | 2.37 | 14.12 |
| $MgSO_4$ | 0.5 | 9.15§ |
| | 1.0 | 7.89§ |
| | 2.0 | 4.59§ |
| | Satd. | 2.88§ |
| $SrCl_2$ | 0.25 | 10.5 |
| | 0.5 | 10.96 |
| | 1.0 | 10.74 |
| | 2.0 | 10.38 |
| $BaCl_2$ | 0.25 | 10.72 |
| | 0.5 | 11.36 |
| | 1.0 | 11.30 |
| $Ba(ClO_4)_2$ | 0.457 | 12.9 |
| $BaBr_2$ | 0.487 | 12.02 |
| $Ba(C_2H_3O_2)_2$ | 0.5 | 10.3 |
| LiCl | 1.27 | 9.32 |
| | 2.54 | 8.80 |
| | 5.07 | 9.80 |
| | 11.4 | 9.06 |
| NaCl | 0.5 | 8.79 |
| | 1.0 | 8.04 |
| | 2.0 | 6.63 |
| | 4.0 | 3.87 |
| | Satd. | 2.62 |
| | 1.0 | 8.48§ |
| | 2.0 | 7.08§ |
| | 4.0 | 4.39§ |
| KCl | 0.5 | 8.93 |
| | 1.0 | 8.07 |
| | 2.0 | 6.40 |
| | Satd. | 3.55 |
| KBr | 2.0 | 7.10 |
| KI | 2.0 | 8.01 |
| $KNO_3$ | 2.0 | 9.25 |
| $KC_2H_3O_2$ | 2.0 | 8.24 |

* 1 *N* aqueous solution.

† Solubility in pure $H_2O$ = 9.58 g/l.

‡ Solubility in pure $H_2O$ = 9.84 g/l.

§ As estimated by van Slyke method.

**$C_6H_{14}O_6$**

Mannitol

C = $PbCl_2$

$t$ = 25° (76)

| Mol B/l (A + B) | Mol C/l soln. |
|---|---|
| $PbCl_2$ | |
| 0.50 | 0.0408 |
| 0.25 | 0.0403 |

### $C_6H_{14}O_6$.—(*Continued*)

C = $PbCl_2$.—(*Continued*)

| Mol B/l (A + B) | Mol C/l soln. |
|---|---|
| $PbCl_2$ | |
| 0.125 | 0.0394 |
| 0.0625 | 0.0384 |
| 0.0313 | 0.0385 |
| 0.0156 | 0.0377 |
| 0 | 0.0388 |

C = $H_3BO_3$

$t$ = 25° (53); *cf.* (2)

Wt. % soln.

| B | C |
|---|---|
| $C_6H_{14}O_6$ | |
| 17.7 | 0 |
| 20.8 | 2.28 |
| 24.7 | 5.13 |
| 25.4 | 5.54 |
| $C_6H_{14}O_6.H_3BO_3$ | |
| 25.1 | 5.70 |
| $H_3BO_3$ | |
| 5.43 | 4.25 |
| 11.5 | 4.68 |
| 17.2 | 5.07 |
| 20.0 | 5.28 |
| 22.5 | 5.52 |

C = $K_2SO_4$

$t$ = 25° (42)

| $K_2SO_4$ | |
|---|---|
| 3.20 | 10.32 |
| 5.82 | 10.07 |
| 8.35 | 9.61 |
| 11.26 | 9.19 |
| 14.30 | 8.66 |
| 17.22 | 8.35 |

### $C_7H_4BrNO_4$

5-Bromo-2-nitrobenzoic acid

C = $C_7H_4BrNO_4$

3-Bromo-2-nitrobenzoic acid

$t$ = 25° (65)

| g B/l A | g C/l (A + B) |
|---|---|
| 3-Bromo-2-nitrobenzoic acid | |
| 0 | 0.33 |
| 1.19 | 1.35 |
| 2.04 | 2.16 |
| 2.99 | 3.09 |
| 4.02 | 4.08 |
| 4.98 | 5.02 |
| 5.87 | 5.92 |
| 10.00 | 7.41 |

### $C_7H_4ClNO_4$

5-Chloro-2-nitrobenzoic acid

C = $C_7H_4ClNO_4$

3-Chloro-2-nitrobenzoic acid

$t$ = 25° (65)

| 3-Chloro-2-nitrobenzoic acid | |
|---|---|
| 0 | 0.47 |
| 3.02 | 3.15 |
| 4.12 | 4.18 |
| 10.00 | 9.67 |

### $C_7H_4N_2O_6$

3, 5-Dinitrobenzoic acid

C = NaCl

$t$ = 25° (133)

| Mol B*/kg soln. | Mol C/l (A+B) |
|---|---|
| $C_7H_4N_2O_6$ | |
| 0.006168 | 0 |
| 0.006412 | 0.10 |
| 0.006305 | 0.25 |
| 0.006161 | 0.5 |
| 0.005389 | 1.0 |

C = KCl

$t$ = 25° (133)

| $C_7H_4N_2O_6$ | |
|---|---|
| 0.006397 | 0.0333 |
| 0.006471 | 0.05 |
| 0.006581 | 0.10 |
| 0.006559 | 0.117 |
| 0.006546 | 0.143 |
| 0.006540 | 0.25 |
| 0.006470 | 0.5 |
| 0.006365 | 0.75 |
| 0.006147 | 1.0 |

C = $KNO_3$

$t$ = 25° (133)

| Mol B†/kg soln. | Mol C/l (A+B) |
|---|---|
| $C_7H_4N_2O_6$ | |
| 0.006344 | 0 |
| 0.007499 | 0.25 |
| 0.008095 | 0.50 |
| 0.008913 | 1.0 |
| 0.009970 | 1.75 |

* After four to ten days.

† After several months, or by cooling hot satd. solution.

### $C_7H_5NO_4$

*o*-Nitrobenzoic acid

C = $C_7H_5N_3O_7$

Methylpicric acid (74)

C = $C_7H_6O_3$

Salicylic acid

$t$ = 25° (74)

Mol/l soln.

| B | C |
|---|---|
| $C_7H_5NO_4$ | |
| 0.04357 | 0.00937 |
| 0.04402 | 0.01356 |
| 0.04413 | 0.01624 |
| $C_7H_6O_3$ | |
| 0.01565 | 0.01447 |
| 0.04310 | 0.01445 |
| 0.04358 | 0.01439 |

C = $KNO_3$

$t$ = 25° (133)

| Mol B/kg soln. | Mol C/l (A+B) |
|---|---|
| $C_7H_5NO_4$ | |
| 0.04380 | 0.0 |
| 0.04627 | 0.25 |
| 0.04606 | 0.50 |
| 0.04448 | 1.00 |

### $C_7H_5NO_4$

*p*-Nitrobenzoic acid

C = $NaC_7H_4NO_4$

*p*-Nitrobenzoate

$t$ = 25° (127)

| Mol B/l soln. | Mol C/l (A+B) |
|---|---|
| $C_7H_5NO_4$ | |
| 0.0024 | 0 |
| 0.0046 | 1 |

### $C_7H_5N_3O_7$

Methylpicric acid

C = $C_7H_6O_3$

Salicylic acid

$t$ = 25° (74)

Mol/l soln.

| B | C |
|---|---|
| $C_7H_5N_3O_7$ | |
| 0.01063 | 0.00981 |
| 0.01072 | 0.01393 |
| $C_7H_6O_3$ | |
| 0.00938 | 0.01532 |

### $C_7H_6O_2$

Benzoic acid

C = NaCl

$t$ = 25° (132)

| Mol B/l soln. | Mol C/l (A+B) |
|---|---|
| $C_7H_6O_2$ | |
| 0.02787 | 0 |
| 0.02542 | 0.25 |
| 0.02312 | 0.50 |
| 0.02602 | 0.75 |
| 0.01825 | 1.00 |

C = $NaC_7H_5O_2$

Benzoate

$t$ = 25° (127)

| $C_7H_6O_2$ | |
|---|---|
| 0.026 | 0 |
| 0.044 | 1.0 |

C = KCl

$t$ = 25° (45)

| $C_7H_6O_2$ | |
|---|---|
| 0.02799 | 0 |
| 0.02416 | 0.5 |
| 0.02802 | 1.0 |

C = KCNS

$t$ = 25° (45)

| $C_7H_6O_2$ | |
|---|---|
| 0.02891 | 0.5 |
| 0.02950 | 1.0 |

### $C_7H_6O_3$

Salicylic acid

C = NaCl

$t$ = 25° (132)

| $C_7H_6O_3$ | |
|---|---|
| 0.01635 | 0.0 |
| 0.01644 | 0.10 |
| 0.01530 | 0.25 |
| 0.01504 | 0.375 |
| 0.01420 | 0.50 |
| 0.01305 | 0.75 |
| 0.01200 | 1.00 |

C = $NaC_7H_5O_3$

Salicylate

$t$ = 25° (127)

| Mol B/l soln. | Mol C/l (A+B) |
|---|---|
| $C_7H_6O_3$ | |
| 0.016 | 0 |
| 0.036 | 1 |

### $C_7H_7NO$

Benzamide

C = Salts

$t$ = 23.7° (123)

| Salt* | g B†/l soln. |
|---|---|
| $C_7H_7NO$ | |
| Mg chloride | 10.90 |
| Ca chloride | 11.26 |
| Sr chloride | 11.01 |
| Ba chloride | 10.79 |
| Li chloride | 11.69 |
| Na chloride | 9.74 |
| Na bromide | 10.88 |
| Na iodide | 12.73 |
| Na sulfate | 8.21 |
| Na formate | 9.64 |
| Na thiocyanate | 13.57 |
| Na acetate | 9.68 |
| Na chloroacetate | 12.33 |
| Na dichloroacetate | 13.21 |
| Na trichloroacetate | 16.69 |
| Na lactate | 9.38 |
| Na malonate | 8.49 |
| Na tartrate | 8.30 |
| Na succinate | 8.71 |
| Na citrate | 8.41 |
| Na benzoate | 19.95 |
| Na salicylate | 20.61 |
| K chloride | 10.7 |

* 1 *N* aqueous solution.

† Solubility in pure $H_2O$ = 12.75 g/l.

### $C_7H_7NO_2$

Aminobenzoic acid

C = NaCl

$t$ = 25° (133)

| Mol B/kg soln. | Mol C/l (A+B) |
|---|---|
| $C_7H_7NO_2$ | |
| 0.05565 | 0 |
| 0.05670 | 0.25 |
| 0.05712 | 0.50 |
| 0.05246 | 1.0 |

C = $KNO_3$

$t$ = 25° (133)

| $C_7H_7NO_2$ | |
|---|---|
| 0.05606 | 0.10 |
| 0.05797 | 0.25 |
| 0.05802 | 0.50 |
| 0.05064 | 1.0 |

### $C_7H_8O$
*o*-Cresol
C = $NaC_{18}H_{33}O_2$
Oleate
$t$ = 20° (7)
Wt. % soln.

| B | C |
|---|---|
| $NaC_{18}H_{33}O_2$ | |
| 2.8 | |
| 7.5 | 2.3 |
| 10.5 | 3.7 |
| 31.3 | 8.5 |
| 49.5 | 8.5 |
| 67.3 | 7.4 |
| 75.5 | 5.6 |
| 80.6 | 3.5 |
| 84.0 | 1.3 |
| 85.1 | 0.7 |
| 85.7 | 0.4 |
| 86.0 | 0.3 |
| 86.4 | |

### $C_7H_8O$
*m*-Cresol
C = $NaC_{18}H_{33}O_2$
Oleate (7)
$NaC_{18}H_{33}O_2$

| | |
|---|---|
| $t$ = 20° | |
| 2.4 | |
| 5.2 | 1.2 |
| 11.0 | 3.5 |
| 16.0 | 5.2 |
| 23.6 | 7.2 |
| 36.4 | 9.1 |
| 42.6 | 11.0 |
| 45.1 | 13.3 |
| 52.8 | 14.1 |
| 61.6 | 12.2 |
| 71.4 | 8.3 |
| 81.2 | 3.7 |
| 84.9 | 1.9 |
| 87.2 | |
| $t$ = 60° | |
| 3.0 | |
| 6.6 | 1.3 |
| 10.5 | 2.6 |
| 22.5 | 5.1 |
| 30.7 | 6.2 |
| 48.6 | 8.6 |
| 54.3 | 10.2 |
| 63.3 | 9.2 |
| 71.0 | 6.6 |
| 79.6 | 2.2 |
| 82.0 | 0.9 |
| 82.7 | 0.5 |
| 83.4 | |

### $C_7H_8O$
*p*-Cresol
C = $NaC_{18}H_{33}O_2$
Oleate
$t$ = 20° (7)
$NaC_{18}H_{33}O_2$

| | |
|---|---|
| 2.0 | |
| 7.5 | 1.7 |
| 12.1 | 2.9 |

C = $NaC_{18}H_{33}O_2$.—(*Cont'd*)
Wt. % soln.

| B | C |
|---|---|
| $NaC_{18}H_{33}O_2$ | |
| 17.2 | 4.1 |
| 35.6 | 7.2 |
| 38.9 | 7.6 |
| 48.8 | 9.1 |
| 62.4 | 9.0 |
| 71.0 | 6.2 |
| 76.4 | 4.1 |
| 80.3 | 2.5 |
| 81.8 | 1.8 |
| 85.2 | |

### $C_7H_9N$
*p*-Toluidine
C = Salts
$t$ = 23.7° (123)

| Salt* | gB†/l soln. |
|---|---|
| $C_7H_9N$ | |
| Mg chloride | 5.68 |
| Ca chloride | 5.51 |
| Sr chloride | 5.69 |
| Ba chloride | 5.10 |
| Li chloride | 6.08 |
| Na chloride | 5.38 |
| Na bromide | 5.99 |
| Na iodide | 7.32 |
| Na sulfate | 4.11 |
| Na formate | 4.57 |
| Na thiocyanate | 14.44 |
| Na acetate | 4.43 |
| Na dichloroacetate | 7.10 |
| Na trichloroacetate | 7.62 |
| Na lactate | 3.93 |
| Na malonate | 3.12 |
| Na tartrate | 3.67 |
| Na succinate | 4.00 |
| Na citrate | 3.37 |
| Na benzoate | 8.74 |
| Na salicylate | 12.72 |
| K chloride | 5.63 |

* 1 *N* aqueous solution.
† Solubility in pure $H_2O$ = 7.10 g/l.

### $C_8H_6O_4$
Phthalic acid
C = $C_{12}H_{22}O_{11}$
Sucrose
$t$ = 25.00° (108)

| B,* Rel. solubility | Mol C/l (A+B) |
|---|---|
| $C_8H_6O_4$ | |
| 0.974 | 0.1547 |
| 0.955 | 0.2962 |
| 0.909 | 0.6199 |
| 0.864 | 0.950 |
| 0.822 | 1.426 |

* Unit of solubility is that in pure $H_2O$, which = 0.04185 g-Mol/l; ($d_4^{25}$ = 1.0022).

### C = $Hg(CN)_2$
$t$ = 25.00° (108)

| B,* Rel. solubility | Mol C/l (A+B) |
|---|---|
| $C_8H_6O_4$ | |
| 1.003 | 0.0304 |
| 1.011 | 0.0668 |
| 1.030 | 0.1733 |
| 1.050 | 0.2959 |
| 1.069 | 0.4000 |

### C = $MgCl_2$
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 0.988 | 0.0628 |
| 0.951 | 0.1236 |
| 0.855 | 0.2690 |
| 0.765 | 0.4212 |
| 0.635 | 0.655 |
| 0.507 | 0.9215 |
| 0.365 | 0.317 |

### C = $CaCl_2$
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 1.005 | 0.0442 |
| 0.974 | 0.0877 |
| 0.861 | 0.295 |
| 0.667 | 0.672 |
| 9.546 | 0.948 |
| 0.374 | 1.461 |
| 0.117 | 3.038 |
| 0.0673 | 4.299 |

### C = $BaCl_2$
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 0.997 | 0.0488 |
| 0.971 | 0.0956 |
| 0.934 | 0.1770 |
| 0.877 | 0.3103 |
| 0.811 | 0.4615 |
| 0.714 | 0.676 |

### C = LiCl
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 0.985 | 0.0827 |
| 0.950 | 0.1957 |
| 0.902 | 0.3322 |
| 0.827 | 0.5354 |
| 0.737 | 0.815 |
| 0.616 | 1.250 |
| 0.497 | 1.727 |

### C = NaCl
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 0.982 | 0.1271 |
| 0.952 | 0.2439 |
| 0.880 | 0.4934 |
| 0.751 | 0.9697 |
| 0.591 | 1.601 |
| 0.476 | 2.203 |
| 0.363 | 2.978 |

* Unit of solubility is that in pure $H_2O$, which = 0.04185 g-Mol/l; ($d_4^{25}$ = 1.0022).
† Wt. % in solvent,

### C = $Na_2SO_4$ (93)

| $t$° | gB/kg soln. 0 % C† | 10 % C† | 15 % C† |
|---|---|---|---|
| | $C_8H_6O_4$ | | |
| 25 | 7.014 | 6.440 | 5.272 |
| 35 | 10.13 | 9.338 | 7.575 |
| 45 | 14.46 | 13.41 | 10.80 |
| 55 | 21.68 | 18.58 | 16.39 |
| 65 | 32.46 | 30.18 | 24.55 |
| 75 | 49.26 | 43.73 | 37.48 |
| 85 | 76.87 | 64.61 | 55.33 |

$t$ = 25.00° (108)

| B,* Rel. solubility | Mol C/l (A+B) |
|---|---|
| $C_8H_6O_4$ | |
| 1.048 | 0.0541 |
| 1.088 | 0.1428 |
| 1.072 | 0.567 |
| 0.952 | 0.898 |
| 0.833 | 1.205 |
| 0.721 | 1.517 |

### C = $NaNO_3$
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 1.004 | 0.2518 |
| 0.981 | 0.487 |
| 0.923 | 0.998 |
| 0.861 | 1.488 |
| 0.795 | 1.962 |
| 0.731 | 2.463 |
| 0.667 | 2.981 |

### C = KF
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 2.448 | 0.1147 |
| 4.434 | 0.2925 |
| 6.410 | 0.5746 |

### C = KCl
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 1.013 | 0.0957 |
| 1.995 | 0.2571 |
| 1.954 | 0.5549 |
| 1.904 | 0.8635 |
| 1.830 | 1.299 |
| 1.744 | 1.808 |

### C = $KClO_3$
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 1.013 | 0.0282 |
| 1.023 | 0.1051 |
| 1.030 | 0.2085 |
| 1.029 | 0.3041 |
| 1.028 | 0.4055 |
| 1.026 | 0.5109 |
| 1.016 | 0.6126 |

**$C_8H_6O_4$.—(*Continued*)**

C = KBr
$t$ = 25.00° (108)

| B,* Rel. solubility | Mol C/l (A + B) |
|---|---|
| $C_8H_6O_4$ | |
| 1.013 | 0.0846 |
| 1.010 | 0.1760 |
| 0.996 | 0.3295 |
| 0.971 | 0.5586 |
| 0.938 | 0.808 |
| 0.785 | 1.828 |

C = $KBrO_3$
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 1.014 | 0.0192 |
| 1.023 | 0.0611 |
| 1.029 | 0.1312 |
| 1.033 | 0.2306 |
| 1.030 | 0.3902 |
| 1.027 | 0.4300 |

C = KI
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 1.014 | 0.0963 |
| 1.029 | 0.1893 |
| 1.021 | 0.3623 |
| 1.000 | 0.6713 |
| 0.947 | 1.250 |
| 0.913 | 1.510 |
| 0.851 | 1.981 |

C = $KIO_3$
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 1.011 | 0.0147 |
| 1.023 | 0.0317 |
| 1.061 | 0.0924 |
| 1.089 | 0.1525 |
| 1.125 | 0.2314 |
| 1.145 | 0.2901 |
| 1.176 | 0.3716 |

C = $K_2SO_4$
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 1.073 | 0.0265 |
| 1.102 | 0.0424 |
| 1.173 | 0.1063 |
| 1.231 | 0.2104 |
| 1.282 | 0.3721 |
| 1.312 | 0.6271 |

C = $KNO_3$
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 1.029 | 0.106 |
| 1.042 | 0.194 |
| 1.056 | 0.335 |
| 1.058 | 0.545 |
| 1.056 | 0.902 |
| 1.042 | 1.269 |
| 1.019 | 1.622 |
| 0.977 | 2.196 |

* Unit of solubility is that in pure $H_2O$, which = 0.04185 g-Mol/l; ($d_4^{25}$ = 1.0022).

C = $KC_2H_3O_2$
Acetate
$t$ = 25.00° (108)

| B*, Rel. solubility | Mol C/l (A + B) |
|---|---|
| $C_8H_6O_4$ | |
| 3.040 | 0.0893 |
| 5.536 | 0.1984 |
| 7.04 | 0.3291 |
| 8.64 | 0.3384 |
| 11.9 | 0.547 |

C = RbCl
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 1.016 | 0.0779 |
| 1.023 | 0.2459 |
| 1.009 | 0.4558 |
| 0.978 | 0.772 |
| 0.937 | 1.142 |
| 0.883 | 1.598 |
| 0.821 | 2.085 |

C = CsCl
$t$ = 25.00° (108)

| $C_8H_6O_4$ | |
|---|---|
| 1.026 | 0.0692 |
| 1.043 | 0.1961 |
| 1.052 | 0.3444 |
| 1.058 | 0.5653 |
| 1.058 | 0.804 |
| 1.050 | 1.144 |
| 1.032 | 1.476 |

* Unit of solubility is that in pure $H_2O$, which = 0.04185 g-Mol/l; ($d_4^{25}$ = 1.0022).

**$C_8H_8O_2$**
*p*-Toluic acid
C = $NaC_8H_7O_2$
Toluate
$t$ = 25° (127)

| Mol B/l soln. | Mol C/l (A + B) |
|---|---|
| $C_8H_8O_2$ | |
| 0.0031 | 0 |
| 0.0054 | 1 |

**$C_8H_{10}N_4O_2$**
Caffeine
C = $C_{11}H_{12}N_2O$
Antipyrine (84)

| $t$° | A* |
|---|---|
| C = 95%* | |
| $C_{11}H_{12}N_2O$ | |
| 107.7 | 0 |
| 89.0 | 4.7 |
| 81.0 | 7.5 |
| 62.0 | 13.6 |
| 49.0 | 19.2 |
| 40 5 | 23.6 |
| 32.0 | 28.9 |
| 25.5 | 34.7 |
| 21.5 | 38.5 |
| 16.0 | 45.4 |

C = $C_{11}H_{12}N_2O$.—(*Cont'd*)

| $t$° | A* |
|---|---|
| C = 90%* | |
| $C_{11}H_{12}N_2O$ | |
| 105.5 | 0 |
| 62.9 | 12.3 |
| 48.1 | 17.7 |
| 43.1 | 22.1 |
| 34.9 | 27.6 |
| 25.7 | 33.3 |
| 20.5 | 38.8 |
| 15.1 | 44.0 |
| 11.4 | 47.5 |
| 7.9 | 51.0 |
| −0.1 | 57.0 |
| C = 85%* | |
| $C_8H_{10}N_4O_2$ | |
| 108.0 | 0 |
| 92.0 | 4.3 |
| 70.1 | 8.8 |
| 54.5 | 13.0 |
| 32.8 | 18.4 |
| $C_{11}H_{12}N_2O$ | |
| 37.4 | 23.4 |
| 32.2 | 27.5 |
| 25.9 | 31.7 |
| $C_8H_{10}N_4O_2.C_{11}H_{12}N_2O$ | |
| 19.5 | 36.5 |
| 13.0 | 43.5 |
| C = 80%* | |
| $C_8H_{10}N_4O_2$ | |
| 123.4 | 0 |
| 74.1 | 12.6 |
| $C_8H_{10}N_4O_2.H_2O$ | |
| 46.2 | 20.2 |
| C = 70%* | |
| $C_8H_{10}N_4O_2$ | |
| 145.1 | 0 |
| 129.0 | 4.6 |
| 115.0 | 8.7 |
| 91.3 | 14.1 |
| 73.9 | 18.5 |
| 55.0 | 23.1 |
| $C_8H_{10}N_4O_2.H_2O$ | |
| 24.2 | 49.9 |
| 20.2 | 56.5 |
| C = 60%* | |
| $C_8H_{10}N_4O_2$ | |
| 163.0 | 0 |
| $C_8H_{10}N_4O_2.H_2O$ | |
| 50.5 | 30.7 |
| 47.0 | 36.3 |
| 44.4 | 40.1 |
| 40.5 | 44.3 |
| 34.2 | 52.3 |
| 29.3 | 58.3 |
| 28.0 | 62.6 |
| $t$° | B† |
| C = 94%† | |
| $C_{11}H_{12}N_2O$ | |
| 89.0 | 0 |
| 85.0 | 4.9 |
| 81.5 | 10.9 |
| $C_8H_{10}N_4O_2$ | |
| 89.0 | 14.9 |
| 105.0 | 19.2 |

C = $C_{11}H_{12}N_2O$.—(*Cont'd*)

| $t$° | B† |
|---|---|
| C = 79.8%† | |
| $C_{11}H_{12}N_2O$ | |
| 48.0 | 0 |
| 47.5 | 6.1 |
| 47.5 | 10.3 |
| $C_8H_{10}N_4O_2.H_2O$ | |
| 48.0 | 14.0 |
| $C_8H_{10}N_4O_2$ | |
| 62.5 | 18.7 |
| 71.0 | 22.2 |
| 86.0 | 26.0 |
| C = 69.2%† | |
| $C_{11}H_{12}N_2O$ | |
| 33.5 | 0 |
| 33.0 | 5.1 |
| 32.5 | 10.9 |
| $C_8H_{10}N_4O_2.H_2O$ | |
| 39.0 | 15.2 |
| 47.0 | 19.9 |
| $C_8H_{10}N_4O_2$ | |
| 57.6 | 24.6 |
| 76.0 | 29.0 |
| 91.0 | 34.4 |
| C = 59.6%† | |
| $C_{11}H_{12}N_2O$ | |
| 23.2 | 0 |
| 21.5 | 5.7 |
| $C_8H_{10}N_4O_2.H_2O$ | |
| 22.0 | 11.1 |
| 31.5 | 15.6 |
| 39.5 | 19.9 |
| 47.0 | 25.0 |
| $C_8H_{10}N_4O_2$ | |
| 61.2 | 30.0 |
| 77.0 | 34.8 |
| 88.0 | 39.6 |
| 100.0 | 45.2 |
| C = 49.7%† | |
| $C_{11}H_{12}N_2O$ | |
| 13.0 | 0 |
| 11.0 | 5.1 |
| $C_8H_{10}N_4O_2.H_2O$ | |
| 19.2 | 10.8 |
| 31.5 | 16.4 |
| 38.5 | 20.2 |
| 45.2 | 25.2 |
| 50.5 | 29.8 |
| $C_8H_{10}N_4O_2$ | |
| 66.5 | 35.8 |
| 78.5 | 40.0 |
| C = 39.5%† | |
| $C_{11}H_{12}N_2O$ | |
| 0 | 0 |
| −0.3 | 5.6 |
| $C_8H_{10}N_4O_2.H_2O$ | |
| 14.5 | 11.0 |
| 25.0 | 15.3 |
| 35.5 | 19.2 |
| 45.3 | 24.9 |
| 51.0 | 30.0 |
| $C_8H_{10}N_4O_2$ | |
| 59.2 | 36.2 |
| 70.0 | 39.8 |

**C = $C_{11}H_{12}N_2O$.—(*Cont'd*)**

| *t*° | B† |
|---|---|
| C = 39.5% † | |
| $C_8H_{10}N_4O_2$ | |
| 80.5 | 44.0 |
| 91.5 | 48.3 |
| C = 29.6% † | |
| Ice | |
| −2.0 | 0 |
| $C_8H_{10}N_4O_2.H_2O$ | |
| 0 | 6.0 |
| 13.0 | 11.0 |
| 26.0 | 15.5 |
| 37.0 | 19.8 |
| 44.5 | 24.8 |
| 51.0 | 30.2 |
| 56.0 | 35.7 |
| $C_8H_{10}N_4O_2$ | |
| 62.5 | 39.5 |
| 77.0 | 45.0 |
| 89.0 | 49.8 |
| 99.0 | 54.6 |
| C = 15% † | |
| Ice | |
| −1.0 | 0 |
| −1.5 | 2.8 |
| −1.8 | 4.7 |
| $C_8H_{10}N_4O_2.2H_2O$ | |
| 16.0 | 7.8 |
| 23.5 | 9.9 |
| 35.6 | 15.1 |
| 45.0 | 21.8 |
| 50.5 | 26.6 |
| 54.5 | 29.8 |
| 58.0 | 35.4 |
| $C_8H_{10}N_4O_2$ | |
| 64.0 | 40.2 |
| 73.5 | 45.1 |
| 84.0 | 50.3 |

* Expressed as wt. % caffeine-antipyrine mixture.

† Expressed as wt. % water-antipyrine mixture.

**C = $NaC_7H_5O_2$**

Benzoate (102)

g/kg A

| B | C |
|---|---|
| *t* = 25° | |
| $C_8H_{10}N_4O_2.H_2O$ | |
| 21.32 | |
| 83.21 | 66.67 |
| 301.5 | 318.8 |
| 381.0 | 450.5 |
| 448.3 | 585.5 |
| $C_8H_{10}N_4O_2.H_2O$ + $NaC_7H_5O_2.H_2O$ | |
| 517.4 | 767.5 |
| $NaC_7H_5O_2.H_2O$ | |
| 462.7 | 766.8 |
| 247.9 | 695.6 |
| 94.75 | 629.7 |
| 0 | 611.7 |

**C = $NaC_7H_5O_2$.—(*Cont'd*)**

g/kg A

| B | C |
|---|---|
| *t* = 49° | |
| $C_8H_{10}N_4O_2.H_2O$ | |
| 46.43 | 0 |
| 314.3 | 253.1 |
| 568.2 | 696.8 |
| $C_8H_{10}N_4O_2.H_2O$ + $NaC_7H_5O_2.H_2O$ | |
| 579.9 | 746.5 |
| $NaC_7H_5O_2.H_2O$ | |
| 559.8 | 740.2 |
| 183.1 | 679.7 |
| 0 | 598.2 |

C = Salts

*t* = 23.7° (123); *cf.* (33)

| Salt* | g B†/l soln. |
|---|---|
| $C_8H_{10}N_4O_2$ | |
| Mg chloride | 16.22 |
| Ca chloride | 16.41 |
| Sr chloride | 15.36 |
| Ba chloride | 14.86 |
| Li chloride | 21.80 |
| Na chloride | 12.75 |
| Na bromide | 20.43 |
| Na iodide | 43.77 |
| Na sulfate | 9.58 |
| Na formate | 11.00 |
| Na thiocyanate | 55.87 |
| Na acetate | 9.49 |
| Na chloroacetate | 16.47 |
| Na dichloroacetate | 32.34 |
| Na trichloroacetate | 80.82 |
| Na lactate | 9.10 |
| Na malonate | 8.20 |
| Na tartrate | 8.55 |
| Na succinate | 8.55 |
| Na citrate | 7.95 |
| Na benzoate | 150.60 |
| Na salicylate | 230.47 |
| K chloride | 13.19 |

* 1 *N* aqueous solution.

† Solubility in pure $H_2O$ = 19.12 g/l.

**$C_9H_8O_2$**

Cinnamic acid

C = $NaC_9H_7O_2$

Cinnamate

*t* = 25° (127)

| Mol B/l soln. | Mol C/l (A+B) |
|---|---|
| $C_9H_8O_2$ | |
| 0.0041 | 0 |
| 0.0105 | 0.5 |

**$C_9H_9NO_3$**

Hippuric acid

C = $NaC_9H_8NO_3$

Hippurate

*t* = 25° (127)

| $C_9H_9NO_3$ | |
|---|---|
| 0.039 | 0 |
| 0.078 | 1 |

**$C_9H_{10}O_2$**

β-Phenylpropionic acid

C = $NaC_9H_9O_2$

β-Phenylpropionate

*t* = 11° (127)

| Mol B/l soln. | Mol C/l (A+B) |
|---|---|
| $C_9H_{10}O_2$ | |
| 0.032 | 0 |
| 0.051 | <1 |

**$C_9H_{11}NO_2$**

Phenylalanine

C = Salts

*t* = 23.7° (123)

| Salt* | g B†/l soln. |
|---|---|
| $C_9H_{11}NO_2$ | |
| Ce chloride | 28.87 |
| Mg chloride | 15.56 |
| Ca chloride | 17.52 |
| Sr chloride | 15.92 |
| Ba chloride | 16.14 |
| Li chloride | 13.53 |
| Na chloride | 11.98 |
| Na bromide | 13.77 |
| Na iodide | 15.41 |
| Na sulfate | 11.45 |
| Na nitrate | 14.29 |
| Na formate | 12.49 |
| Na thiocyanate | 16.48 |
| Na acetate | 11.04 |
| Na chloroacetate | 12.31 |
| Na dichloroacetate | 13.20 |
| Na trichloroacetate | 14.29 |
| Na lactate | 9.67 |
| Na malonate | 11.65 |
| Na tartrate | 10.96 |
| Na succinate | 11.40 |
| Na citrate | 11.99 |
| Na benzoate | 15.86 |
| Na salicylate | 19.93 |
| K chloride | 12.79 |

* 1 *N* aqueous solution.

† Solubility in pure $H_2O$ = 14.06 g/l.

**$C_{10}H_{12}O_2$**

Cis-tetrahydronaphthalene-1,2-diol

C = $H_3BO_3$

*t* = 25° (53)

Wt. % soln.

| B | C |
|---|---|
| $H_3BO_3$ | |
| 1.85 | 3.94 |
| 2.08 | 3.92 |
| 2.09 | 3.93 |
| $C_{10}H_{12}O_2.H_3BO_3$ | |
| 2.12 | 3.92 |
| 2.18 | 3.88 |
| $C_{10}H_{12}O_2$ | |
| 1.99 | 1.55 |
| 2.10 | 3.29 |

**$C_{10}H_{16}O_4$**

*d*-Camphoric acid

C = $MgC_{10}H_{14}O_4$

Camphorate

*t* = 15° (72)

Wt. % soln.

| B | C |
|---|---|
| $C_{10}H_{16}O_4$ | |
| 1.20 | 1.29 |
| 1.98 | 3.53 |
| 2.36 | 5.66 |
| 2.85 | 8.19 |
| 3.16 | 10.30 |
| $C_{10}H_{16}O_4$ + $MgC_{10}H_{14}O_4.14H_2O$ | |
| 3.42 | 16.33 |
| 3.62 | 16.61 |
| $MgC_{10}H_{14}O_4.14H_2O$* | |
| 3.60 | 16.70 |
| 1.91 | 15.10 |
| 0.00 | 14.25 |

* $MgC_{10}H_{14}O_4.14H_2O$ effloresces to $MgC_{10}H_{14}O_4.7H_2O$ in air. $MgC_{10}H_{14}O_4.5H_2O$ separates from hot solutions.

**C = $CaC_{10}H_{14}O_4$**

Camphorate

*t* = 15° (72)

Wt. % soln.

| B | C |
|---|---|
| $C_{10}H_{16}O_4$ | |
| 1.35 | 1.23 |
| 1.57 | 1.97 |
| 1.71 | 2.55 |
| 2.18 | 4.34 |
| 2.33 | 4.73 |
| 2.90 | 7.75 |
| $C_{10}H_{16}O_4$ + $CaC_{10}H_{14}O_4.7H_2O$ | |
| 2.99 | 8.70 |
| 3.00 | 8.66 |
| 3.08 | 8.87 |
| $CaC_{10}H_{14}O_4.7H_2O$ | |
| 3.07 | 8.59 |
| 1.50 | 7.94 |
| 0.00 | 7.37 |
| $CaC_{10}H_{14}O_4.4H_2O$ | |
| 0.00 | 12.21 |
| 0.00 | 8.68 (100°) |

**C = $SrC_{10}H_{14}O_4$**

Camphorate

*t* = 16−17° (72)

Wt. % soln.

| B | C |
|---|---|
| $C_{10}H_{16}O_4$ | |
| 1.25 | 1.413 |
| $SrC_{10}H_{14}O_4$ + $3C_{10}H_{16}O_4.2H_2O$ | |
| 1.03 | 1.771 |
| 1.13 | 6.525 |
| 1.20 | 12.45 |
| 1.20 | 17.99 |
| $SrC_{10}H_{14}O_4.4H_2O$ | |
| 0.00 | 16.76 |
| 0.00 | 12.86 (99°) |

### $C_{10}H_{16}O_4$.—(*Continued*)

C = $BaC_{10}H_{14}O_4$
Camphorate
D = $BaC_{10}H_{14}O_4.3C_{10}H_{16}O_4.2H_2O$
E = $BaC_{10}H_{14}O_4.4H_2O$
$t$ = 16-17° (72)
Wt. % soln.

| B | C |
|---|---|
| B + D | |
| 0.68 | 0.134 |
| 0.84 | 0.150 |
| D | |
| 0.69 | 0.20 |
| 0.79 | 0.35 |
| 0.78 | 0.40 |
| 0.38 | 2.59 |
| 0.44 | 11.10 |
| 0.48 | 22.71 |
| 0.45 | 32.19 |
| 0.50 | 37.22 |
| 0.50 | 40.71 |
| D + E | |
| 0.525 | 40.96 |
| 0.50 | 40.99 |
| E | |
| 0.00 | 40.90 |
| 0.00 | 41.42 |
| 0.00 | 42.59 |

C = $Li_2C_{10}H_{14}O_4$
Camphorate
$t$ = 16-17° (72)

| $C_{10}H_{16}O_4$ | |
|---|---|
| 2.02 | 3.77 |
| $Li_2C_{10}H_{14}O_4.7C_{10}H_{16}O_4$ | |
| 3.25 | 10.63 |
| 3.51 | 12.61 |
| $Li_2C_{10}H_{14}O_4.C_{10}H_{16}O_4$ | |
| 3.99 | 20.56 |
| 3.43 | 24.69 |
| 2.87 | 37.16 |
| 0.00 | 40.80 |

C = $Na_2C_{10}H_{14}O_4$
Camphorate (72)
$t$ = 13.5°

| $C_{10}H_{16}O_4$ | |
|---|---|
| 0.623 | 0.00 |
| $Na_2C_{10}H_{14}O_4.5C_{10}H_{16}O_4$ | |
| 2.87 | 9.06 |
| 2.74 | 13.28 |
| 2.68 | 14.99 |
| 2.64 | 17.53 |
| 2.77 | 20.36 |
| 2.77 | 26.57 |
| 2.74 | 30.69 |
| 2.63 | 32.75 |
| $Na_2C_{10}H_{14}O_4.3H_2O$ | |
| 0.88 | 49.60 |
| 0.00 | 50.13 |

$t$ = 14.5°

| $C_{10}H_{16}O_4$ | |
|---|---|
| 2.03 | 4.19 |

### C = $Na_2C_{10}H_{14}O_4$.—(*Cont'd*)

Wt. % soln.

| B | C |
|---|---|
| $C_{10}H_{16}O_4$ + $Na_2C_{10}H_{14}O_4.5C_{10}H_{16}O_4$ | |
| 2.97 | 7.80 |
| $Na_2C_{10}H_{14}O_4.5C_{10}H_{16}O_4$ | |
| 2.94 | 10.46 |
| 2.77 | 17.43 |
| 2.89 | 27.41 |
| $Na_2C_{10}H_{14}O_4.C_{10}H_{16}O_4$ | |
| 2.29 | 40.10 |
| 2.17 | 40.54 |
| 1.06 | 47.04 |

$t$ = 19.5°

| $C_{10}H_{16}O_4$ | |
|---|---|
| 0.716 | 0.00 |
| 1.68 | 2.46 |
| 3.06 | 9.36 |
| 3.24 | 9.79 |
| $Na_2C_{10}H_{14}O_4.5C_{10}H_{16}O_4$ | |
| 3.23 | 14.76 |
| 3.02 | 14.84 |
| 3.04 | 19.27 |
| 3.88 | 29.18 |
| 4.13 | 30.62 |
| 3.24 | 32.68 |
| $Na_2C_{10}H_{14}O_4.C_{10}H_{16}O_4$ | |
| 1.68 | 40.38 |
| 1.40 | 43.92 |
| 1.83 | 44.16 |

C = $K_2C_{10}H_{14}O_4$
Camphorate
$t$ = 15-17° (72)

| $C_{10}H_{16}O_4$ | |
|---|---|
| 2.0 | 4.6 |
| 2.3 | 6.1 |
| 2.5 | 6.8 |
| 2.8 | 8.1 |
| 2.9 | 9.7 |
| 3.1 | 11.6 |
| $K_2C_{10}H_{14}O_4.7C_{10}H_{16}O_4$ | |
| 2.9 | 12.4 |
| 3.1 | 22.1 |
| 3.2 | 25.1 |
| 3.3 | 28.6 |
| $K_2C_{10}H_{14}O_4.3C_{10}H_{16}O_4$ | |
| 3.2 | 29.4 |
| 2.9 | 32.8 |
| 3.0 | 35.6 |
| 2.8 | 45.2 |
| 3.2 | 50.6 |
| $K_2C_{10}H_{14}O_4.C_{10}H_{16}O_4.H_2O$ | |
| 3.2 | 58.2 |
| 2.6 | 59.3 |
| 1.5 | 62.4 |
| $K_2C_{10}H_{14}O_5$ | |
| 1.1 | 66.8 |
| 1.0 | 69.0 |
| 0.9 | 69.7 |
| $K_2C_{10}H_{14}O_4.5H_2O$ | |
| 0.0 | 65.83 |

### $C_{11}H_{12}N_2O$

Antipyrine
C = $C_{11}H_{12}N_2O.C_7H_6O_3$
Antipyrine salicylate
$t$ = 18° (82)

| Mol B/l(A+B) | g C/l soln. |
|---|---|
| $C_{11}H_{12}N_2O.C_7H_6O_3$ | |
| 0 | 0.0132 |
| 0.025 | 0.00712 |
| 0.05 | 0.00520 |
| 0.10 | 0.00432 |

### $C_{12}H_{22}O_{11}$

Sucrose
C = $HgCl_2$
$t$ = 25° (97)

| Wt. % B in (A + B) | g C/kg soln. |
|---|---|
| $HgCl_2$ | |
| 10 | 73.1 |
| 25 | 81.5 |
| 30 | 85.0 |
| 35 | 88.3 |
| 40 | 92.0 |
| 42.5 | 93.7 |
| 47 | 96.9 |
| 55 | 103.0 |

C = $Ca(OH)_2$
$t$ = 25° (18); *cf.* (46)

| Wt. % soln. | | $d_4^{25}$ soln. |
|---|---|---|
| B | C | |
| $Ca(OH)_2$ | | |
| 0 | 0.117 | 0.983 |
| 0.62 | 0.188 | 1.000 |
| 4.82 | 0.73 | 1.021 |
| 7.50 | 1.355 | 1.037 |
| 9.87 | 2.31 | 1.051 |
| 11.90 | 3.21 | 1.067 |
| 15.1 | 4.57 | 1.092 |
| 17.42 | 5.38 | 1.109 |
| 19.86 | 6.07 | 1.123 |

C = $CaSO_3$ (111)

| g B/l A | g C/l soln. |
|---|---|
| $CaSO_3$ | |
| $t$ = 45–46° | |
| 116.0 | 0.36 |
| 240.0 | 0.54 |
| 420.0 | 0.54 |
| 713.0 | 0.40 |
| 0 | 0.48 |
| $t$ = 60–62° | |
| 146.3 | 0.45 |
| 241.4 | 0.46 |
| 421.3 | 0.44 |
| 743.4 | 0.39 |
| 0 | 0.45 |

C = $Sr(OH)_2$ (126)

C = NaCl
$t$ = 25° (115)
Wt. % soln.

| B | C |
|---|---|
| $C_{12}H_{22}O_{11}$ | |
| 66.0 | 1.62 |
| 63.0 | 6.15 |

### C = NaCl.—(*Continued*)

Wt. % soln.

| B | C |
|---|---|
| $C_{12}H_{22}O_{11}$ + NaCl.$C_{12}H_{22}O_{11}$.$2H_2O$ | |
| 62.2 | 8.6 |
| NaCl.$C_{12}H_{22}O_{11}.2H_2O$ | |
| 57.0 | 9.75 |
| NaCl.$C_{12}H_{22}O_{11}.2H_2O$ + NaCl | |
| 43.0 | 16.2 |
| NaCl | |
| 36.7 | 17.5 |
| 12.7 | 23.3 |

C = $K_2SO_4$
$t$ = 25° (42)

| $K_2SO_4$ | |
|---|---|
| 9.56 | 9.65 |
| 18.55 | 8.65 |
| 28.16 | 7.42 |
| 37.24 | 6.35 |
| 47.55 | 5.21 |
| 57.00 | 4.24 |

### $C_{13}H_8N_4O_8$

*o*-Picraminobenzoic acid
C = KOH
$t$ = 25° (24)
Mol/l soln.

| B | C |
|---|---|
| $C_{13}H_8N_4O_8$ + $KC_{13}H_7N_4O_8$ | |
| 0.005794 | 0.006566 |
| 0.005775 | 0.006555 |
| 0.005675 | 0.006725 |

### $C_{14}H_8O_2$

Phenanthraquinone
C = Salts (79)

### $C_{11}H_{12}N_2O.C_7H_6O_3$

Antipyrine salicylate
C = $NaC_7H_5O_3$
Salicylate (82)

| Mol B/l (A + B) | Mol C/l soln. |
|---|---|
| $C_{11}H_{12}N_2O.C_7H_6O_3$ | |
| 0 | 0.0132 |
| 0.05 | 0.0114 |
| 0.1 | 0.0122 |
| 0.2 | 0.0126 |

### $C_{20}H_{14}O_4$

Phenolphthalein
C = $Na_2O$
$t$ = 25° (10)
Wt. % soln.

| B | C |
|---|---|
| $C_{20}H_{14}O_4$ | |
| 2.90 | 0.58 |
| 13.74 | 2.71 |
| 22.43 | 4.25 |
| 31.96 | 6.11 |
| $NaC_{20}H_{13}O_4.8H_2O$ | |
| 36.06 | 6.95 |
| 37.73 | 7.48 |
| 41.16 | 8.32 |

**C = $Na_2O$.**—(*Continued*)

| Wt. % soln. B | Wt. % soln. C |
|---|---|
| $NaC_{20}H_{13}O_4.4H_2O$ | |
| 33.34 | 6.78 |
| 37.36 | 9.31 |
| 41.45 | 9.88 |
| 44.06 | 10.06 |
| $Na_2C_{20}H_{12}O_4$ | |
| 45.55 | 11.00 |
| 40.16 | 12.31 |
| $Na_2C_{20}H_{12}O_4.4H_2O$ | |
| 37.79 | 11.67 |
| 34.68 | 11.98 |
| $Na_2C_{20}H_{12}O_4.8H_2O$ | |
| 38.42 | 9.97 |
| 33.72 | 10.17 |
| $Na_3C_{20}H_{11}O_4.14H_2O$ | |
| 31.00 | 10.24 |
| 27.89 | 10.37 |
| 25.03 | 11.34 |
| 23.28 | 12.69 |
| $Na_3C_{20}H_{11}O_4.13H_2O$ | |
| 20.51 | 13.73 |
| 10.35 | 17.48 |
| $Na_3C_{20}H_{11}O_4.12H_2O$ | |
| 9.12 | 19.8 |
| 4.28 | 20.32 |
| 1.37 | 23.46 |
| 0.86 | 25.42 |
| $Na_3C_{20}H_{11}O_4.6H_2O$ | |
| 0.11 | 27.01 |
| 0.0 | 28.03 |
| 0.0 | 30.74 |
| 0.23 | 37.44 |
| $Na_3C_{20}H_{11}O_4.6H_2O$ + NaOH.-$H_2O$ | |
| 0.00 | 39.88 |

**Casein**

**C = NaCl**

$t$ = room (110)

| g B/l (A + B) | Mol C/l (A + B) Casein |
|---|---|
| 0.64 | 0.0365 |
| 1.43 | 0.0690 |
| 1.86 | 0.0794 |
| 2.48 | 0.0922 |
| 2.68 | 0.0925 |
| 2.87 | 0.1019 |
| 3.24 | 0.1064 |
| 3.46 | 0.1114 |
| 3.44 | 0.1213 |
| 3.37 | 0.1231 |
| 3.11 | 0.1265 |
| 2.97 | 0.1311 |
| 2.82 | 0.1362 |
| 2.52 | 0.1469 |
| 2.09 | 0.1568 |
| 1.87 | 0.1605 |
| 1.65 | 0.1748 |
| 1.55 | 0.1853 |
| 1.50 | 0.2023 |
| 1.40 | 0.2284 |
| 1.39 | 0.2340 |
| 1.32 | 0.2725 |

**$H_3BO_3$**

**C = Alkaloids (9)**

**$Na_2Sb_2O_6.6H_2O$**

**C = $NaC_2H_3O_2$**

Acetate (145)

| $t°$ | mg B/l soln. 1 % C* | 2.5 % C* | 5 % C* |
|---|---|---|---|
| 18.0 | 61 | 31 | Tr. |
| 25.0 | 146 | 40 | Tr. |
| 33.5 | 205 | 94 | 4.2 |

* Expressed as wt. % aqueous Na acetate.

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# FREEZING-POINT—SOLUBILITY DATA FOR NON-METALLIC SYSTEMS CONTAINING MORE THAN THREE COMPONENTS*

F. C. KRACEK

## AQUEOUS SYSTEMS

A = $H_2O$; Standard arrangement; for abbreviations, *v.* p. 4
B = HCl; C = $C_{10}H_8$, Naphthalene; D = $C_{16}H_{11}N_3O_7$, Naphthalene picrate; E = KCl; F = $KC_6H_2N_3O_7$, Picrate; 20.1°C (2).

B = HCl; $C_1$ = $C_6H_4O_2$, Quinone; $C_2$ = $C_6H_6O_2$, 1, 4-Dihydroxybenzene; $C_3$ = $C_{12}H_{10}O_4$, Quinhydrone; D = NaCl. Solubility of C in A + B + D at 18.1°C (30).

B = HCl; C = $C_6H_3N_3O_7$, Picric acid; D = KCl; E = $KC_6H_2N_3O_7$, Picrate. One point at 20.1°C (2).

B = HCl; C = $C_6H_8ClN$, Aniline hydrochloride; D = $FeCl_3$. Approximate values of solubility of $FeCl_3.6(C_6H_8ClN)$ and $FeCl_3.2(C_6H_8ClN)$ in aqueous solutions of 5 to 22% HCl at 25° (23).

B = $HClO_4$; C = $C_2H_6O$, Ethyl alcohol; D = $KClO_4$. Solubility of $KClO_4$ in 93–98% alcohol solutions containing small amounts of $HClO_4$ (31).

B = $I_2$; C = $C_2H_6O$, Ethyl alcohol; D = KI (24)
R = Wt. ratio A/C; $t$ = 25°C

| Wt. % D | Wt. % B | |
|---|---|---|
| | R = 40/60 | R = 60/40 |
| | $I_2$ | |
| 0 | 23.05 | 3.0 |
| 2.5 | 29.9 | 10.1 |
| 5 | 36.7 | 17.4 |
| 7.5 | 43.4 | 24.9 |
| 10.0 | 49.8 | 32.6 |
| 12.5 | 56.2 | 40.5 |
| 15.0 | 62.5 | 49.1 |
| 17.5 | 68.5 | 58.9 |
| 20.0 | | 71.2 |
| | $I_2 + KI_n$ | |
| 19.55 | 73.3 | |
| 20.55 | | 74.8 |
| | $KI_n$ | |
| 20.0 | 72.4 | |
| 21 | 70.2 | 74.0 |
| 22 | 67.4 | 72.1 |
| 23 | 64.1 | 70.0 |
| 24 | 60.4 | 67.6 |
| 25 | | 65.2 |
| 26 | | 62.7 |
| 27 | | 60.1 |
| 28 | | 57.4 |
| | $KI_n + KI$ | |
| 24.5 | 58.6 | |
| 28.3 | | 56.7 |
| | KI | |
| 25 | 51.2 | |
| 26 | 37.9 | |
| 27 | 26.8 | |
| 28 | 18.0 | |
| 29 | 10.7 | 53.1 |

B = $I_2$; C = $C_2H_6O$; D = KI.—(*Continued*)

| Wt. % D | Wt. % B; Solid phase = KI | |
|---|---|---|
| | R = 40/60 | R = 60/40 |
| 30 | 4.7 | 48.3 |
| 30.9 | 0 | |
| 32.5 | | 36.4 |
| 35 | | 25.3 |
| 37.5 | | 15.3 |
| 40 | | 6.5 |
| 42.1 | | 0 |

B = $H_2SO_4$; C = $HNO_3$; D = $C_7H_5N_3O_6$, "TNT." Solubility of TNT. in mixed acids at 25°C (21).

B = $H_2SO_4$ (conc.); C = $C_2H_6O$, Ethyl alcohol (absolute); $D_1$ = $(NH_4)_2Ga_2(SO_4)_2.24H_2O$; $D_2$ = $Cs_2Ga_2(SO_4)_2.24H_2O$ (5)

| Solvent, cm³ | | | g D/100 cm³ soln. | |
|---|---|---|---|---|
| A | B | C | $D_1$ | $D_2$ |
| | $t$ = 25°C; solid phase = D | | | |
| 100 | 0 | 0 | 30.84 | 1.51 |
| 50 | 0 | 50 | 0.0217 | 0.00387 |
| 30 | 0 | 70 | 0.00875 | 0.00356 |
| 35 | 15 | 50 | 0.1613 | 0.0228 |

B = $H_2SO_4$; C = $C_6H_6O$, Phenol; D = $C_5H_5N$, Pyridine
$L_I + L_{II}$; room temperature (16)

| | | | | | |
|---|---|---|---|---|---|
| Equiv./l..... | B | 9.63 | 9.63 | 9.63 | 9.63 |
| | D | 0 | 0.25 | 0.5 | 1.0 |
| g/l in $H_2O$ layer | C | 20.4 | 177 | 615 | >1008 |

B = $NH_3$; C = $C_2H_6O$, Ethyl alcohol; D = Cu (resp. Cd; Ni) ammonium complex (12).

B = $HNO_3$; C = $C_3H_6O$, Acetone; D = $Bi(NO_3)_3$ (6)

| M B/l | % C | M D/l | M B/l | % C | M D/l |
|---|---|---|---|---|---|
| | $Bi(NO_3)_3$; $t$ = ? | | | | |
| 0.922 | 0 | 2.23 | 2.3 | 0 | 2.04 |
| 0.922 | 6.67 | 2.17 | 2.3 | 16.7 | 1.89 |
| 0.922 | 13.3 | 2.08 | | | |

B = $NH_4NO_3$; C = $(NH_4)_2SO_4$; D = $C_2H_6O$, Ethyl alcohol; at 30°C (32).

B = $NH_4NO_3$; C = $CH_4O$, Methyl alcohol; D = $C_2H_6O$, Ethyl alcohol (27)
R = Wt. ratio C/D = 51.7/48.4; $t$ = 30°C; solid phase = $NH_4NO_3$

| Wt. % | | | Wt. % | | |
|---|---|---|---|---|---|
| A | B | R | A | B | R |
| 29.9 | 70.1 | 0 | 23.2 | 46.2 | 30.6 |
| 27.3 | 62.8 | 9.9 | 22.9 | 43.8 | 33.3 |
| 27.0 | 61.2 | 11.8 | 16.4 | 26.0 | 57.6 |
| 26.0 | 58.6 | 15.4 | 11.5 | 17.8 | 71.7 |
| 24.8 | 52.1 | 23.1 | 3.4 | 11.7 | 84.9 |

* Except aqueous solutions containing only strong electrolytes (for which *v.* p. 270) and except systems containing a refractory oxide (for which *v.* p. 83).

**B = $NH_4NO_3$; C = $C_2H_6O$, Ethyl alcohol; D = $AgNO_3$ (27)**
R = Wt. ratio C/A; $t$ = 30°C

| R = 41.8/58.2 | | R = 71.2/28.8 | | R = 91.3/8.7 | |
|---|---|---|---|---|---|
| Wt. % B | Wt. % D | Wt. % B | Wt. % D | Wt. % B | Wt. % D |
| | | $AgNO_3$ | | | |
| 0 | 45.0 | 0 | 19.0 | 0 | 7.0 |
| 6.41 | 46.65 | 4.36 | 22.1 | 2.20 | 7.7 |
| 13.18 | 46.7 | 9.90 | 24.3 | 7.23 | 9.4* |
| | | $AgNO_3 + AgNO_3.NH_4NO_3$ | | | |
| 21.0 | 48.4 | 11.6 | 25.6 | 4.7 | 8.5 |
| | | $AgNO_3.NH_4NO_3$ | | | |
| 22.1 | 46.7 | 20.1 | 18.0 | 5.74 | 6.58 |
| 29.1 | 37.7 | 27.6 | 14.84 | | |
| | | $AgNO_3.NH_4NO_3 + NH_4NO_3$ | | | |
| 44.9 | 24.9 | 28.9 | 14.65 | 9.7 | 4.30 |
| | | $NH_4NO_3$ | | | |
| 49.3 | 12.1 | 28.2 | 6.8 | 9.4 | 2.09 |
| 53.2 | 0 | 29.0 | 0 | 9.0 | 0 |

* Metastable with respect to $AgNO_3$.

**B = $NH_4Cl$; C = $C_3H_6O$, Acetone; D = $BaCl_2$ (18)**

| $L_I$, Wt. % | | | $L_{II}$, Wt. % | | |
|---|---|---|---|---|---|
| B | C | D | B | C | D |
| | | $L_I + L_{II} + NH_4Cl$; 18°C | | | |
| 8.67 | 49.3 | 0.67 | 3.06 | 68.7 | 0.13 |
| 9.63 | 45.4 | 0.88 | 2.58 | 71.7 | 0.09 |
| | | $L_I + L_{II} + NH_4Cl + BaCl_2.2H_2O$; 18°C | | | |
| 11.5 | 42.3 | 1.34 | 2.4 | 74.0 | 0.01 |
| | | $L_I + L_{II} + BaCl_2.2H_2O$; 18°C | | | |
| 10.4 | 42.6 | 1.4 | 2.25 | 74.0 | 0.01 |
| 10.1 | 43.4 | 1.78 | 2.22 | 71.8 | 0.01 |
| 10.0 | 43.4 | 1.83 | 2.12 | 66.0 | 0.01 |
| | | $L_I + L_{II} + NH_4Cl$; 30°C | | | |
| 17.5 | 29.0 | 0.0 | 1.5 | 84.4 | 0.0 |
| 18.0 | 27.4 | 2.1 | 0.9 | 84.7 | 0.1 |
| | | $L_I + L_{II} + NH_4Cl + BaCl_2.2H_2O$; 30°C | | | |
| 16.9 | 24.1 | 3.1 | 0.63 | 85.2 | 0.1 |

**B = $(NH_4)_2SO_4$; C = $C_2H_6O$, Ethyl alcohol; D = $MnSO_4$ (26.5)**

**B = $(NH_4)_2SO_4$; C = $C_2H_6O$, Ethyl alcohol; D = $Li_2SO_4$ (26)**

| $L_I$ or $L_{III}$, Wt. % | | | $L_{II}$ or $L_{IV}$, Wt. % | | |
|---|---|---|---|---|---|
| C | B | D | C | B | D |
| | | $L_I + L_{II} + LiNH_4SO_4$; 6.5°C | | | |
| 32.05 | 6.89 | 2.67 | 11.33 | 19.57 | 7.13 |
| 37.37 | 5.19 | 1.95 | 9.21 | 22.17 | 7.64 |
| 39.41 | 4.70 | 1.52 | 7.59 | 24.68 | 7.30 |
| | | $L_I + L_{II} + LiNH_4SO_4 + (NH_4)_2SO_4$; 6.5°C | | | |
| 55.51 | 1.76 | 0.343 | 4.80 | 33.27 | 6.40 |
| | | $L_I + L_{II} + (NH_4)_2SO_4$; 6.5°C | | | |
| 53.2 | 2.01 | 0.348 | 5.0 | 33.3 | 5.56 |
| 43.5 | 4.49 | 0.379 | 8.2 | 31.4 | 2.68 |
| | | $L_I + LiNH_4SO_4$; 30°C | | | |
| 0 | 19.6 | 16.3 | | | |
| 8.84 | 13.7 | 11.9 | | | |
| 16.7 | 11.0 | 9.09 | | | |
| 23.5 | 8.23 | 7.08 | | | |
| 36.9 | 3.93 | 3.38 | | | |
| 45.6 | 2.35 | 1.96 | | | |
| 70.1 | 0.18 | 0.15 | | | |
| 83.8 | 0.026 | 0.22 | | | |
| | | $L_I + L_{II} + (NH_4)_2SO_4$; 30°C | | | |
| 57.0 | 2.3 | 0 | 5.7 | 37.5 | 0 |
| 63.5 | 1.13 | 0.09 | 3.82 | 37.3 | 3.21 |
| 66.9 | 0.82 | 0.11 | 3.47 | 37.2 | 5.01 |
| | | $L_I + L_{II} + (NH_4)_2SO_4 + LiNH_4SO_4$; 30°C | | | |
| 67.4 | 0.72 | 0.12 | 3.45 | 35.8 | 5.69 |

**B = $(NH_4)_2SO_4$; C = $C_2H_6O$; D = $Li_2SO_4$.—*(Continued)***

| $L_I$ or $L_{III}$, Wt. % | | | $L_{II}$ or $L_{IV}$, Wt. % | | |
|---|---|---|---|---|---|
| C | B | D | C | B | D |
| | | $L_I + L_{II} + LiNH_4SO_4$; 30°C | | | |
| 65.9 | 0.76 | 0.14 | 3.79 | 34.6 | 5.9 |
| 49.5 | 2.34 | 1.07 | 7.29 | 21.7 | 8.7 |
| 48.9 | 2.36 | 1.09 | 7.37 | 21.6 | 8.8 |
| 39.1 | 3.88 | 2.61 | 10.97 | 15.6 | 9.4 |
| 35.1 | 4.66 | 3.51 | 13.0 | 13.5 | 9.2 |
| | | $L_{III} + L_{IV} + LiNH_4SO_4$; 30°C | | | |
| 33.95 | 2.93 | 6.24 | 16.3 | 6.8 | 12.8 |
| | | $L_{III} + L_{IV} + LiNH_4SO_4 + Li_2SO_4.H_2O$; 30°C | | | |
| 39.3 | 1.96 | 5.03 | 12.94 | 7.1 | 14.8 |
| | | $L_{III} + L_{IV} + Li_2SO_4.H_2O$; 30°C | | | |
| 31.0 | 3.02 | 8.63 | 20.2 | 4.87 | 12.0 |
| $L_I + LiNH_4SO_4$; 50°C | | | $L_{II} + LiNH_4SO_4$; 50°C | | |
| 47.3 | 2.08 | 1.7 | 0 | 19.7 | 16.4 |
| 56.4 | 0.94 | 0.76 | 6.0 | 16.0 | 13.2 |
| 76.3 | 0.058 | 0.047 | 9.5 | 14.1 | 11.6 |
| | | $L_I + L_{II} + (NH_4)_2SO_4$; 50°C | | | |
| 64.5 | 1.2 | 0 | 4.1 | 41.1 | 0 |
| 66.9 | 0.85 | 0.019 | 3.66 | 40.4 | 2.16 |
| | | $L_I + L_{II} + (NH_4)_2SO_4 + LiNH_4SO_4$; 50°C | | | |
| 69.5 | 0.54 | 0.065 | 3.06 | 39.9 | 5.12 |
| | | $L_I + L_{II} + LiNH_4SO_4$; 50°C | | | |
| (At this temperature the two immiscible areas present at 30°C have merged into one) | | | | | |
| 53.5 | 1.91 | 0.804 | 6.21 | 23.9 | 8.85 |
| 48.0 | 2.48 | 1.47 | 8.08 | 18.9 | 9.85 |
| 42.2 | 3.02 | 2.83 | 11.0 | 13.7 | 10.4 |
| 41.2 | 2.53 | 3.69 | 11.7 | 10.4 | 12.9 |
| 42.9 | 2.08 | 3.54 | 10.9 | 10.1 | 14.0 |
| 45.7 | 1.53 | 3.31 | 9.9 | 9.3 | 15.6 |
| | | $L_I + L_{II} + Li_2SO_4$; 50°C | | | |
| 33.4 | 2.3 | 6.8 | 17.8 | 5.8 | 12.5 |

**B = $H_3PO_4$; C = $C_6H_8O_7$, Citric acid; D = NaOH (25)**
Concentrations in millimol/liter

| B | C | D | B | C | D |
|---|---|---|---|---|---|
| $Na_2HPO_4.12H_2O$; 20°C | | | $NaH_2C_6H_5O_7.H_2O$; 20°C | | |
| 556 | 0 | 1112 | 542 | 1105 | 525 |
| 564 | 167.4 | 1128 | 3035 | 1156 | 7496 |
| 1570 | 343 | 3140 | 1370 | 1293 | 1762 |
| 1553 | 371 | 3106 | 894 | 1485 | 1437 |
| 2142 | 526 | 4284 | 1415 | 1603 | 1562 |
| $C_6H_8O_7.H_2O$; 20°C | | | 768 | 1675 | 2129 |
| 566 | 4070 | 1131 | 781 | 2035 | 2124 |
| 136 | 4010 | 272 | 1010 | 2216 | 1423 |
| 85.3 | 3913 | 171 | 745 | 2769 | 3646 |
| 0 | 3816 | 0 | 657 | 2958 | 1275 |
| | | | 422 | 3548 | 1615 |

**B = $CH_4O$, Methyl alcohol; C = $C_2H_6O$, Ethyl alcohol; D = KF.** Solubility of KF in aqueous mixtures of methyl and ethyl alcohols at room temp. Two liquid phases (15).

**B = $CH_4O$, Methyl alcohol; C = $C_2H_6O$, Ethyl alcohol; D = $KNO_3$ (27)**
R = Wt. ratio B/C = 51.7/48.3; $t$ = 30°C; solid phase = $KNO_3$

| Wt. % | | | Wt. % | | |
|---|---|---|---|---|---|
| A | R | D | A | R | D |
| 68.7 | 0 | 31.3 | 47.1 | 47.8 | 5.1 |
| 68.4 | 12.7 | 18.9 | 40.1 | 56.4 | 3.5 |
| 64.3 | 22.9 | 12.8 | 24.0 | 74.8 | 1.2 |
| 52.3 | 41.0 | 6.7 | | | |

B = $CH_4O$, Methyl alcohol; C = $C_3H_6O$, Acetone; D = KF
Critical solutions; $t$ = 20°C (14)

| $L_I$, Wt. % | | | $L_{II}$, Wt. % | | |
|---|---|---|---|---|---|
| B | C | D | B | C | D |
| | | $L_I + L_{II}$ | | | |
| 0.14 | 1.08 | 32.6 | 22.0 | 10.4 | 16.4 |
| 0.68 | 5.25 | 20.2 | 22.7 | 40.4 | 3.03 |
| 1.40 | 9.90 | 16.13 | 23.9 | 36.2 | 4.0 |
| 1.46 | 11.40 | 14.69 | 25.3 | 31.6 | 5.2 |
| 2.19 | 17.02 | 11.43 | 25.8 | 46.3 | 2.10 |
| 2.45 | 17.3 | 11.2 | 26.8 | 25.7 | 7.33 |
| 2.79 | 21.6 | 9.5 | 28.0 | 41.3 | 2.75 |
| 3.50 | 27.1 | 7.6 | 28.4 | 18.3 | 10.7 |
| 3.51 | 24.8 | 8.6 | 29.0 | 13.8 | 13.8 |
| 4.0 | 28.7 | 7.5 | 29.7 | 11.1 | 14.6 |
| 8.55 | 55.3 | 1.93 | 30.1 | 36.1 | 3.65 |
| 8.96 | 52.8 | 2.42 | 31.3 | 33.0 | 4.46 |
| 9.96 | 46.0 | 4.21 | 32.5 | 29.6 | 5.30 |
| 10.3 | 43.7 | 4.97 | 35.2 | 20.8 | 8.9 |
| 10.6 | 41.4 | 5.8 | 42.8 | 19.4 | 9.3 |
| 10.8 | 39.2 | 7.0 | 33.9 | 53.0 | 1.72 |
| 15.0 | 9.2 | 15.9 | 35.4 | 37.9 | 3.10 |
| 15.5 | 45.9 | 2.43 | 37.3 | 33.9 | 4.05 |
| 16.8 | 40.6 | 3.37 | 39.5 | 29.0 | 5.16 |
| 17.5 | 37.4 | 4.12 | 42.0 | 22.3 | 7.62 |
| 20.8 | 20.9 | 9.75 | 44.7 | 7.9 | 17.7 |

B = $C_2H_4O_2$, Acetic acid; C = $CaC_4H_4O_6$, Tartrate; D = $KC_2H_3O_2$, Acetate. Solubilities of Ca tartrate at 25°C (17).

B = $C_2H_6O$, Ethyl alcohol; C = $C_5H_{12}O$, $n$-Amyl alcohol; D = NaCl (13)

| $L_I$, Wt. % | | | $L_{II}$, Wt. % | | |
|---|---|---|---|---|---|
| B | C | D | B | C | D |
| | | $L_I + L_{II}$; 28°C | | | |
| 16.9 | 77.3 | 0.2 | 6.0 | 0.6 | 15.9 |
| 26.3 | 59.7 | 0.4 | 12.6 | 1.2 | 10.0 |
| 29.0 | 56.6 | 0.6 | 11.0 | 1.0 | 14.5 |
| 38.5 | 34.5 | 2.2 | 17.5 | 1.9 | 13.4 |
| 40.3 | 37.2 | 2.0 | 16.4 | 1.4 | 15.3 |
| | | $L_I + L_{II}$ + NaCl; 28°C | | | |
| 0 | 95.4 | 0.5 | 0 | 0.22 | 26.35 |
| 9.5 | 86.6 | 0.10 | 1.9 | 0.25 | 25.3 |
| 19.1 | 75.4 | 0.25 | 4.5 | 0.3 | 24.0 |
| 30.9 | 59.9 | 0.58 | 6.9 | 0.4 | 22.6 |
| 38.7 | 47.0 | 1.23 | 10.3 | 0.5 | 21.2 |
| 44.8 | 31.6 | 2.81 | 15.2 | 1.3 | 19.3 |
| 41.5 | 17.7 | 6.56 | 22.1 | 3.6 | 15.8 |
| 32.5 | 10.0 | 11.0 crit. | 32.5 | 10.0 | 11.0 crit. |
| L, Wt. % | | | L, Wt. % | | |
| | | L + NaCl; 28°C | | | |
| 55.18 | 38.42 | 0.15 | 56.48 | 10.35 | 3.98 |
| 41.16 | 48.84 | 0.36 | 55.77 | 11.41 | 3.97 |
| 66.42 | 19.79 | 0.69 | 51.31 | 4.60 | 6.49 |
| 52.41 | 32.03 | 0.96 | 38.54 | 13.58 | 8.26 |
| 65.12 | 8.80 | 2.39 | 36.54 | 8.65 | 9.95 |
| 53.86 | 23.08 | 2.13 | 29.35 | 5.29 | 13.0 |

B = $C_2H_6O$, Ethyl alcohol; C = $C_7H_6O_2$, Benzoic acid; D = $C_7H_5NO_2$, Ammonium benzoate (26.5).

B = $C_2H_6O$, Ethyl alcohol; C = $AgNO_3$; D = $KNO_3$ (27)
$t$ = 30°C; Wt. ratio B/A = 51.6/48.4

| Wt. % | | Solid | Wt. % | | Solid |
|---|---|---|---|---|---|
| C | D | phase | C | D | phase |
| 37.0 | 0 | C | 16.5 | 4.11 | D |
| 36.9 | 2.62 | C + CD | 5.15 | 4.55 | |
| 21.3 | 4.26 | D + CD | 0 | 4.8 | |

B = $C_2H_6O$, Ethyl alcohol; C = NaCl; D = $Na_2SO_4$ (28, 29)

| Wt. % B | Wt. % D | Wt. % C |
|---|---|---|
| | $Na_2SO_4.10H_2O$ + NaCl; 15°C | |
| 0 | 5.64 | 23.39 |
| 7.13 | 3.5 | 20.8 |
| 8.81 | 3.47 | 20.25 |
| | $Na_2SO_4.10H_2O$ + $Na_2SO_4$ + NaCl; 15°C | |
| 9.78 | 2.96 | 19.94 |
| | $Na_2SO_4$ + NaCl; 15°C | |
| 10.11 | 2.92 | 19.76 |
| 13.69 | 2.06 | 18.63 |
| 15.35 | 1.78 | 17.98 |
| 24.77 | 0.85 | 14.93 |
| 45.42 | 0.15 | 8.48 |
| 73.86 | 0.008 | 2.05 |
| | $Na_2SO_4.10H_2O$ + $Na_2SO_4$; 15°C | |
| 21.45 | 1.25 | 14.79 |
| 30.91 | 0.68 | 11.41 |
| 41.90 | 0.23 | 7.65 |
| 57.64 | 0.03 | 2.67 |
| 72.0 | 0.03 | 0 |
| | $Na_2SO_4$; 15°C | |
| 43.25 | 0.22 | 8.24 |
| 61.87 | 0.03 | 2.79 |
| | $Na_2SO_4.10H_2O$ + $Na_2SO_4$; 25°C | |
| 0 | 15.22 | 13.78 |
| 6.24 | 10.10 | 11.82 |
| 11.84 | 6.41 | 10.42 |
| 20.33 | 3.26 | 7.95 |
| 29.44 | 1.51 | 5.40 |
| 37.62 | 0.69 | 3.35 |
| 53.0 | 0.4 | 0 |
| | $Na_2SO_4$ + NaCl; 25°C | |
| 0 | 6.85 | 22.85 |
| 10.69 | 2.41 | 19.97 |
| 19.09 | 1.26 | 17.11 |
| 21.03 | 1.07 | 16.46 |
| 31.03 | 0.57 | 13.20 |
| 37.62 | 0.34 | 11.48 |
| 37.88 | 0.34 | 11.12 |
| 57.30 | 0.005 | 5.88 |
| 72.68 | 0 | 2.52 |
| | $Na_2SO_4$; 25°C | |
| 36.96 | 0.60 | 4.79 |
| 20.93 | 2.53 | 9.35 |
| | $Na_2SO_4$ + NaCl; 35°C | |
| 0 | 6.14 | 23.44 |
| 9.88 | 2.34 | 20.57 |
| 17.72 | 1.30 | 17.86 |
| 28.35 | 0.67 | 14.35 |
| 36.12 | 0.45 | 12.08 |
| 55.52 | 0.056 | 6.05 |
| 79.94 | 0.019 | 1.39 |

B = $C_2H_6O$, Ethyl alcohol; C = NaCl; D = $Na_2CO_3$ (3)

| $L_I$, Wt. % | | | $L_{II}$, Wt. % | | |
|---|---|---|---|---|---|
| B | C | D | B | C | D |
| | | $L_I + L_{II}$ + $Na_2CO_3.10H_2O$; 30°C | | | |
| 44.8 | 0 | 1.38 | 3.41 | 0 | 26.14 |
| 48.5 | 1.01 | 1.21 | 2.93 | 1.15 | 26.38 |
| | | $L_I + L_{II}$ + $Na_2CO_3.10H_2O$ + $Na_2CO_3.7H_2O$; 30°C | | | |
| 50.65 | 1.39 | 1.0 | 3.59 | 1.63 | 25.5 |
| | | $L_I + L_{II}$ + $Na_2CO_3.7H_2O$; 30°C | | | |
| 53.2 | 3.07 | 0.61 | 3.07 | 5.14 | 24.0 |
| | | $L_I + L_{II}$ + $Na_2CO_3.7H_2O$ + $Na_2CO_3.H_2O$; 30°C | | | |
| 54.92 | 4.03 | 0.59 | 4.79 | 6.51 | 19.45 |

**B = $C_2H_6O$; C = NaCl; D = $Na_2CO_3$.—(*Continued*)**

| $L_I$, Wt. % | | | $L_{II}$, Wt. % | | |
|---|---|---|---|---|---|
| B | C | D | B | C | D |
| $L_I + L_{II} + Na_2CO_3.H_2O$; 30°C | | | | | |
| 52.15 | 4.62 | 0.56 | 4.89 | 7.16 | 19.21 |
| 43.5 | 6.78 | 1.41 | 7.31 | 9.02 | 16.42 |
| 34.6 | 8.42 | 3.39 | 12.29 | 10.81 | 12.11 |
| 25.7 | 10.32 | 5.60 crit. | 25.74 | 10.32 | 5.60 crit. |
| $L_I$, Wt. % | | | $L_I$, Wt. % | | |
| $L_I + L_{II}$ (no solid phase); 30°C | | | | | |
| 23.14 | 9.04 | 6.69 crit. | 16.10 | 0 | 10.84 crit. |
| 18.94 | 3.29 | 8.62 crit. | | | |
| $L + Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$; 30°C | | | | | |
| 2.52 | 1.85 | 25.9 | 51.7 | 1.30 | 0.66 |
| $L + Na_2CO_3.7H_2O + Na_2CO_3.H_2O$; 30°C | | | | | |
| 4.15 | 7.20 | 19.5 | 64.7 | 1.72 | 0.36 |
| 59.3 | 2.83 | 0.44 | | | |
| $L + Na_2CO_3.H_2O + NaCl$; 30°C | | | | | |
| 0 | 14.13 | 18.0 | 42.0 | 9.3 | 1.08 |
| 9.06 | 15.47 | 10.1 | 61.8 | 4.63 | 0.41 |
| 21.0 | 13.9 | 6.02 | | | |
| $L + Na_2CO_3.H_2O$; 30°C | | | | | |
| 69.23 | 3.03 | ? | 84.9 | 0.89 | |
| 78.1 | 1.18 | | 94.4 | 0.19 | |

**B = $C_2H_6O$, Ethyl alcohol; C = NaBr; D = $Na_2CO_3$ [3]**

| $L_I$, Wt. % | | | $L_{II}$, Wt. % | | |
|---|---|---|---|---|---|
| B | C | D | B | C | D |
| $L_I + L_{II}$ (critical curve) [no solid phase]; 30°C | | | | | |
| 15.6 | 6.82 | 10.6 | | | |
| 15.9 | 3.34 | 10.7 | | | |
| 16.1 | 0 | 10.8 | | | |
| $L_I + L_{II} + Na_2CO_3.10H_2O$; 30°C | | | | | |
| 44.81 | 0 | 1.38 | 3.41 | 0 | 26.1 |
| 41.8 | 2.20 | 1.62 | 3.06 | 1.02 | 25.7 |
| 37.7 | 5.00 | 2.02 | 3.69 | 2.93 | 24.6 |
| 36.7 | 5.47 | 2.11 | 3.70 | 3.84 | 24.2 |
| $L_I + L_{II} + Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$; 30°C | | | | | |
| 34.4 | 6.66 | 2.65 | 3.78 | 4.67 | 22.9 |
| $L_I + L_{II} + Na_2CO_3.7H_2O$; 30°C | | | | | |
| 33.1 | 7.45 | 2.72 | 4.02 | 4.96 | 22.8 |
| 29.7 | 8.9 | 3.64 | 5.47 | 6.51 | 21.0 |
| 22.7 | 10.0 | 6.3 | 8.15 | 8.52 | 17.1 |
| 15.2 | 10.8 | 10.4 crit. | | | |
| $L_I$, Wt. % | | | $L_I$, Wt. % | | |
| $L + Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$; 30°C | | | | | |
| 2.58 | 4.82 | 24.4 | 46.3 | 3.79 | 0.82 |
| 39.4 | 5.98 | 1.42 | 55.7 | 0 | 0.53 |
| $L + Na_2CO_3.7H_2O + Na_2CO_3.H_2O$; 30°C | | | | | |
| 10.3 | 17.2 | 11.0 | 49.2 | 11.5 | 0.39 |
| 21.2 | 16.9 | 5.27 | 62.8 | 6.09 | 0.26 |
| 34.6 | 15.3 | 1.33 | 73.1 | 0 | 0.11 |
| $L + Na_2CO_3.H_2O + Na_2CO_3$; 30°C | | | | | |
| 73.7 | 10.12 | ?* | 84.3 | 5.26 | ? |
| $L + Na_2CO_3.H_2O + NaBr.2H_2O$; 30°C | | | | | |
| 8.23 | 42.7 | 1.15 | 21.05 | 36.9 | 0.41 |
| 14.21 | 39.8 | 0.69 | 27.8 | 33.9 | 0.23 |
| $L + Na_2CO_3.H_2O$; 30°C | | | | | |
| 20.7 | 36.3 | 0.54 | 52.0 | 21.7 | ? |
| 40.6 | 26.9 | ?* | | | |
| $L + Na_2CO_3$; 30°C | | | | | |
| 59.3 | 18.5 | ?* | 78.2 | 10.0 | ? |
| $L + Na_2CO_3.H_2O + Na_2CO_3 + NaBr.2H_2O$; 30°C | | | | | |
| 54.7 | 21.0 | | | | |

* $Na_2CO_3$ concentration negligibly small.

**B = $C_2H_6O$, Ethyl alcohol; C = NaI; D = $Na_2CO_3$ [3]**

| $L_I$, Wt. % | | | $L_{II}$, Wt. % | | |
|---|---|---|---|---|---|
| B | C | D | B | C | D |
| $L_I + L_{II}$ (critical curve); 30°C | | | | | |
| 16.1 | 0 | 10.84 | | | |
| 16.5 | 3.01 | 10.91 | | | |
| 13.86 | 5.35 | 11.4 | | | |
| 11.62 | 8.02 | 13.4 | | | |
| 9.56 | 9.47 | 16.3 | | | |
| $L_I + L_{II} + Na_2CO_3.10H_2O$; 30°C | | | | | |
| 41.75 | 3.98 | 1.41 | 2.47 | 0.67 | 25.53 |
| 29.7 | 8.67 | 3.47 | 3.60 | 4.80 | 23.28 |
| 24.9 | 9.75 | 4.75 | 6.06 | 7.91 | 21.27 |
| 22.1 | 10.54 | 5.63 | 9.52 | 9.20 | 17.73 |
| 9.56 | 9.47 | 16.26 crit. | | | |
| $L_I$, Wt. % | | | $L_I$, Wt. % | | |
| $L + Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$; 30°C | | | | | |
| 0 | 9.3 | 24.3 | 29.59 | 11.1 | 2.49 |
| 9.04 | 11.4 | 14.5 | 48.86 | 4.62 | 0.47 |
| 19.31 | 12.1 | 6.61 | 55.70 | 0 | 0.43 |
| $L + Na_2CO_3.7H_2O + Na_2CO_3.H_2O$; 30°C | | | | | |
| 0 | 25.4 | 15.3 | 36.4 | 19.4 | 0.74 |
| 10.5 | 27.1 | 6.61 | 55.1 | 9.8 | 0.40 |
| 21.1 | 25.3 | 3.00 | 73.1 | 0 | 0.11 |
| $L + Na_2CO_3.H_2O + Na_2CO_3$; 30°C | | | | | |
| 41.6 | 37.4 | ?* | 20.0 | 51.5 | |
| 64.0 | 22.8 | | | | |
| $L + Na_2CO_3 + NaI.2H_2O$; 30°C | | | | | |
| 48.3 | 40.4 | ?* | 31.0 | 47.2 | |
| $L + Na_2CO_3.H_2O + Na_2CO_3 + NaI.2H_2O$; 30°C | | | | | |
| 4.99 | 61.6 | ?* | | | |

* $Na_2CO_3$ concentration negligibly small.

**B = $C_2H_6O$, Ethyl alcohol; $C_1$ = KOH; $C_2$ = KCl; D = $K_2CO_3$; at 30°C [32].**

**B = $C_3H_6O$, Acetone; C = $CuCl_2$; D = NaCl [18]**

| $L_I$, Wt. % | | | $L_{II}$, Wt. % | | |
|---|---|---|---|---|---|
| B | C | D | B | C | D |
| $L_I + L_{II} + NaCl$; 30°C | | | | | |
| 19.00 | 0 | 18.50 | 84.2 | 0 | 0.41 |
| 20.20 | 3.3 | 16.60 | 80.85 | 1.55 | 1.66 |
| 22.65 | 10.7 | 12.10 | 68.20 | 4.43 | 3.55 |
| 23.10 | 11.2 | 11.53 | 64.10 | 5.07 | 4.03 |
| 27.50 | 13.4 | 10.60 | 54.60 | 8.26 | 5.60 |
| 29.90 | 13.8 | 10.55 | 53.50 | 8.40 | 5.40 |
| 41 | 12 | 8 crit. | 41 | 12 | 8 crit. |
| $L_I$, Wt. % | | | $L_I$, Wt. % | | |
| $L + CuCl_2.2H_2O + NaCl$; 30°C | | | | | |
| 0 | 36.86 | 10.25 | 32.5 | 27.95 | 5.90 |
| 8.8 | 35.60 | 7.45 | 57.7 | 16.40 | 3.72 |
| 11.9 | 34.70 | 6.70 | 70.7 | 9.60 | 4.00 |
| 22.9 | 31.00 | 5.94 | 80.6 | 4.67 | 3.50 |
| L + NaCl; 30°C | | | | | |
| 29.1 | 18.7 | 5.78 | 44.5 | 18.9 | 5.30 |
| 38.0 | 20.9 | 4.09 | 61.4 | 10.35 | 4.30 |

**B = $C_3H_8O_3$, Glycerol; C = $C_6H_6O$, Phenol; D = $NH_4Al(SO_4)_2$·12$H_2O$.** At *ca.* 20°C, a solution saturated with D has 18.5% B, 3.09% C and 4.43% D [10].

B = $C_3H_8O_3$, Glycerol; C = Alkaloids; D = $H_3BO_3$
Solution before saturation contains 50 g B and variable quantities of D per 100 cm³. Solubility of C in g/100 cm³ soln. (1)

| C \ g D/100 cm³ | 3 | 5 | 7.65 | 15.3 |
|---|---|---|---|---|
| Eserine, $C_{15}H_{21}N_2O_3$ | 2.5 | | | |
| Morphine, $C_{17}H_{19}NO_3$ | 5.5 | | | |
| Cocaine, $C_{17}H_{21}NO_4$ | 8 | | | |
| Atropine, $C_{17}H_{23}NO_3$ | 10 | | | |
| Codeine, $C_{18}H_{21}NO_3$ | 4 | | | |
| Quinine, $C_{20}H_{24}N_2O_2$ | | | 20 | 40 |
| Strychnine, $C_{21}H_{22}N_2O_2$ | 3.5 | | | |
| Veratrine, $C_{32}H_{49}NO_9$ | 6 | 15 | | |

B = $C_4H_{10}O$, Ethyl ether; C = $HgI_2$; D = KI (11)

| $L_I$, Wt. % | | | $L_{II}$, Wt. % | | | $L_{III}$, Wt. % | | |
|---|---|---|---|---|---|---|---|---|
| B | C | D | B | C | D | B | C | D |
| $L_I + L_{II} + L_{III}$ (no solid phase); 20°C | | | | | | | | |
| 88.3* | 6.2 | 2.1 | 23.4 | 30.8 | 16.7 | 23.4 | 30.8 | 16.7 |
| 87.9† | 6.2 | 2.2 | 23.2 | 30.9 | 16.6 | ←just disappears→ | | |
| 87.0 | 6.8 | 2.2 | 28.5 | 30.6 | 15.8 | 18.4 | 32.4 | 18.5 |
| 86.7† | 6.8 | 2.3 | 33.3 | 29.4 | 14.3 | ←disappears→ | | |
| ←disappears†→ | | | 37.7 | 30.1 | 13.2 | 12.8 | 33.0 | 20.3 |
| 85.4 | 7.7 | 2.7 | 38.7 | 28.7 | 13.1 | 12.9 | 32.9 | 20.5 |
| 85.4 | 7.5 | 2.7 | 39.4 | 28.8 | 12.5 | 12.9 | 32.6 | 20.8 |
| 77.5 | 12.8 | 4.1 | 47.7 | 26.6 | 10.3 | 12.4 | 34.2 | 21.9 |
| 78.2 | 11.2 | 4.5 | 49.1 | 25.9 | 10.3 | 10.7 | 34.5 | 22.2 |
| 68.9 | 16.6 | 5.8 | 58.0 | 21.9 | 8.8 | 10.1 | 35.9 | 22.4 |
| 69.2 | 16.8 | 6.0 | 58.6 | 21.6 | 8.7 | 9.8 | 34.7 | 23.0 |
| 64.3‡ | 19.2 | 7.1 | 64.3 | 19.2 | 7.1 | 10.0 | 35.2 | 22.4 |

| $L_I$, Wt. % | | | $L_{II}$, Wt. % | | |
|---|---|---|---|---|---|
| B | C | D | B | C | D |
| $L_I + L_{II} + KHgI_3.H_2O$; 20°C | | | | | |
| 76.6 | 14.0 | 5.3 | 0.6 | 51.0 | 36.4 |
| 44.5 | 33.8 | 14.1 | 1.4 | 51.7 | 33.7 |
| 32.7 | 39.6 | 17.6 | 2.4 | 50.3 | 32.4 |
| 23.7 | 42.8 | 19.7 | 2.9 | 49.5 | 31.7 |
| 9.0 | 47.2 | 26.6 crit. | 9.0 | 47.2 | 26.6 crit. |
| $L_I + L_{II} + HgI_2$; 20°C | | | | | |
| 96.2 | 1.6 | 0.2 | 12.4 | 10.5 | 3.5 |
| 95.8 | 1.9 | 0.3 | 18.3 | 15.5 | 4.4 |
| 86.1 | 8.7 | 1.4 | 50.7 | 26.5 | 5.2 |
| 77.0 | 14.0 | 2.5 | 60.0 | 22.9 | 4.3 |
| 73.5 | 15.6 | 3.0 | 63.0 | 21.5 | 4.0 |
| 69.4 | 17.9 | 3.1 | 69.4 | 17.9 | 3.1 |
| $L + L_{II} + KI + KHgI_3$; 20°C | | | | | |
| 94.7 | 3.0 | 1.2 | 0.6 | 51.1 | 38.5 |
| $L_I + L_{II} + KI$; 20°C | | | | | |
| 99.2 | *ca.* 0 | 0.4 | 3.7 | *ca.* 0 | 55.6 |
| $L_I + L_{II} + HgI_2 + KHgI_3$; 20°C | | | | | |
| 93.8 | 4.3 | 1.1 | ←disappears→ | | |
| 95.4 | 3.2 | 1.0 | 28.8 | 54.3 | 15.6 |
| ←disappears→ | | | 24.8 | 58.2 | 17.0 |

| $L_I$, Wt. % | | | $L_I$, Wt. % | | |
|---|---|---|---|---|---|
| $L_I + HgI_2 + KHgI_3.H_2O$; 20°C | | | | | |
| 0 | 50.3 | 26.7 | 45.1 | 41.0 | 9.5 |
| 9.4 | 50.7 | 22.1 | 52.6 | 34.6 | 8.6 |
| 19.1 | 50.1 | 17.0 | 73.8 | 19.2 | 4.5 |
| 35.4 | 46.0 | 12.1 | 84.6 | 12.0 | 1.5 |
| 39.0 | 44.0 | 11.2 | | | |

* Critical concentration, $L_{II} = L_{III}$.
† Phase disappears without necessarily becoming identical with another phase; not a critical point. ‡ Critical concentration, $L_I = L_{II}$.

B = $C_6H_6O$, Phenol; C = $C_7H_8O$, *o*- + *m*- + *p*-Cresols (4, 22).
For temperatures of formation of two liquid phases in mixtures of phenol with aqueous solutions of various organic and inorganic compounds, *v.* (7, 8, 9).

B = $C_2H_3ClO_2$, Chloroacetic acid; C = $CaC_4H_4O_6$, Tartrate; D = $KC_2H_2ClO_2$, Chloroacetate. Solubilities of Ca tartrate at 25°C (17).

B = $CaC_4H_4O_6$, Tartrate; C = KCl; D = $KC_2H_3O_2$, Acetate. Solubilities of Ca tartrate at 25°C (17).

## NON-AQUEOUS SYSTEMS

### $C_2H_4O_2$

Acetic acid

B = $C_4H_6O_3$, Acetic anhydride, C = $C_7H_7NO$, Benzamide; D = $C_9H_9NO_2$, Acetylbenzoylimide (19)
Mixtures consist of *x* M % of 1:1 (A + D) with 100-*x* M % 1:1 (B + C)

| *x* % | °C ± 1° | *x* % | °C ± 1° |
|---|---|---|---|
| Solid C | | Solid D | |
| 0 | 90 | 40 | *ca.* 50 |
| 10 | 86 | 50 | 58 |
| 20 | 78 | 60 | 66 |
| 30 | 66 | 70 | 72 |
| 35 | 58 | 80 | 77 |
| 39 | *ca.* 50 | 90 | 81 |
| | | 100 | 84 |

B = $C_4H_6O_3$, Acetic anhydride; C = $C_7H_5N$, Benzonitrile; D = $C_7H_7NO$, Benzamide; E = $C_9H_9NO_2$, Acetylbenzoylimide (19). *See* Figure, p. 429.

### $C_2H_3N$

Acetonitrile

B = $C_2H_4O_2$, Acetic acid; C = $C_2H_5NO$, Acetamide; D = $C_4H_6O_3$, Acetic anhydride (20)
Mixtures consist of *x* M % of 1:1 (A + B) with 100-*x* M % 1:1 (C + D)

| *x* % | °C ± 1° | *x* % | °C ± 1° | *x* % | °C ± 1° |
|---|---|---|---|---|---|
| Solid C | | Solid $BC_2$ (?) | | Solid B | |
| 0 | 50 | *ca.* 32 | −22 | *ca.* 58 | −29.5 |
| 10 | 37 | 35 | −21.5 | 60 | −26.5 |
| 20 | +18 | 40 | −22 | 70 | −14.5 |
| 30 | −14 | 50 | −25 | 80 | −6 |
| *ca.* 32 | −22 | *ca.* 58 | −29.5 | 90 | −0.5 |
| | | | | 100 | +2.5 |

## LITERATURE

(For a key to the periodicals see end of volume)

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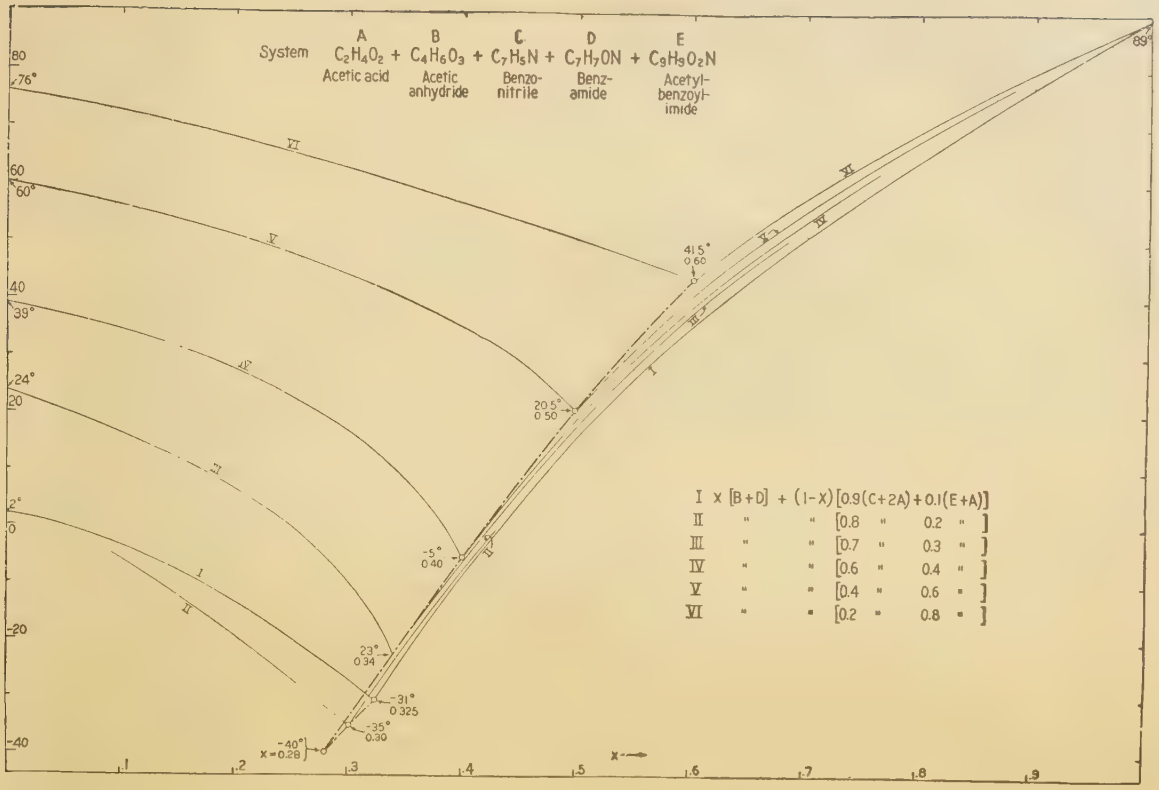


# OSMOTIC PRESSURE

W. E. Garner

In this section are included data on osmotic pressure obtained by direct measurement. With few exceptions, only those pressures are given which are generated by solutions of pure substances when separated from the pure solvent by a semipermeable membrane. Where appreciable amounts of diffusion have occurred or the solution is not opposed by the pure solvent, this is indicated in the tables. Wherever possible the pressures are expressed in normal atmospheres and the concentrations of the solutions in gram formula weights per 1000 g of the solvent (M/1000) in terms of the table of atomic weights, Vol. I, p. 43. Where the pressures measured are small they are given in mm Hg. Values are given to the last significant figure for which *relative* accuracy can be claimed.

## SOLUTIONS IN WATER MAINLY WITH COPPER FERROCYANIDE MEMBRANES

$C_{12}H_{22}O_{11}$, Sucrose, 342.2, $P_{osm.}$ in Atm. (41)

| °C / M/1000 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 60 | 70 | 80 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.1 | (2.48) | 2.47 | 2.52 | 2.56 | 2.61 | 2.65 | 2.50 | 2.58 | 2.66 | 2.74 | | |
| 0.2 | 4.76 | 4.86 | 4.93 | 5.03 | 5.11 | 5.19 | 5.09 | 5.21 | 5.32 | 5.48 | | |
| 0.3 | 7.14 | 7.26 | 7.39 | 7.54 | 7.67 | 7.79 | 7.71 | 7.91 | 8.04 | 8.21 | | |
| 0.4 | 9.52 | 9.69 | 9.87 | 10.03 | 10.22 | 10.38 | 10.38 | 10.69 | 10.81 | 10.96 | | |
| 0.5 | 12.00 | 12.20 | 12.40 | 12.65 | 12.86 | 13.05 | 13.09 | 13.47 | 13.62 | 13.78 | 14.11 | |
| 0.6 | 14.50 | 14.73 | 14.98 | 15.27 | 15.52 | 15.76 | 15.85 | 16.28 | 16.46 | 16.67 | 16.96 | |
| 0.7 | 17.03 | 17.35 | 17.65 | 17.97 | 18.29 | 18.59 | 18.66 | 19.10 | 19.37 | 19.57 | 19.74 | |
| 0.8 | 19.65 | 19.99 | 20.34 | 20.72 | 21.09 | 21.44 | 21.56 | 21.99 | 22.31 | 22.52 | 22.76 | 23.26 |
| 0.9 | 22.32 | 22.68 | 23.09 | 23.51 | 23.93 | 24.34 | 24.44 | 24.95 | 25.35 | 25.50 | 25.79 | 26.14 |
| 1.0 | 25.05 | 25.51 | 25.92 | 26.42 | 26.87 | 27.29 | 27.47 | 27.94 | 28.46 | 28.63 | 28.87 | 29.07 |

$C_{12}H_{22}O_{11}$, 342.2, $P_{osm.}$ IN ATM.—(*Continued*)

| M/1000 | 0.1 | 0.3 | 0.6 | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | 6.0 | Super-satd. |
|---|---|---|---|---|---|---|---|---|---|---|
| 0°C (7) | 2.25 | 6.91 | 14.22 | 24.76 | 54.9 | 90.0 | 129.7 | | | |
| 30°C (23, 35) | | | | | 58.6 | 95.8 | 141.2 | 193 | | 268.8 |
| 57.7°C (23, 35) | | | | | 62.5 | 101.5 | 145.4 | 195.9 | 248 | |

$C_6H_{12}O_6$, GLUCOSE, 180.09, $P_{osm.}$ IN ATM. (39, 40)

| °C / M/1000 | 0 | 10 | 23 | °C / M/1000 | 0 | 10 | 23 |
|---|---|---|---|---|---|---|---|
| 0.1 | 2.42 | 2.41 | 2.41 | 0.6 | 14.13* | 14.43 | 14.5 |
| .2 | 4.69 | 4.80 | 4.79 | .7 | 16.51 | 16.84 | 17.0 |
| .3 | 7.07 | 7.17 | 7.21 | .8 | 18.92 | 19.20 | 19.4 |
| .4 | 9.38 | 9.60 | 9.64 | .9 | 21.42 | 21.56 | 21.8 |
| .5 | 11.75 | 12.01 | 12.14 | 1.0 | 23.78* | 23.99 | 24.3 |

* Berkeley and Hartley's data (*v.infra*) give 13.4 and 22.9, resp.

$C_6H_{11}O_6CH_3$, α-METHYL GLUCOSIDE (7)

| M/1000 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Atm., 0°C | 25.0 | 53.8 | 86.4 | 120.2 |

$C_6H_{12}O_6$, GALACTOSE (6)

| g/l | 250 | 380 | 500 |
|---|---|---|---|
| Atm., 0°C | 35.5 | 62.8 | 95.8 |

$C_6H_{12}O_6$, GLUCOSE (6)

| g/l | 99.8 | 199.5 | 319.2 | 448.6 | 548.6 |
|---|---|---|---|---|---|
| Atm., 0°C | 13.2 | 29.2 | 53.2 | 87.9 | 121.2 |

$C_6H_{14}O_6$, MANNITOL (6)

| g/l | 100 | 110 | 125 |
|---|---|---|---|
| Atm., 0°C | 13.1 | 14.6 | 16.7 |

$C_6H_{14}O_6$, Isodulcitol, M/1000 = 2, $P_{osm.}$ (0°C) = 54.8 atm. (7).

$C_6H_6O$, PHENOL, 94.06, 30°C (24)

| M/1000 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|
| $P_{osm.}$ | 1.46 | 2.84 | 3.93 | 5.12 | 6.40 | 7.62 | 8.82 | 10.05 | 11.28 |

| Substance | Formula | M/1000 | t, °C | Atm. | Lit. |
|---|---|---|---|---|---|
| Amygdalin | $C_{20}H_{27}NO_{11}$ | 0.0219 | 0 | 0.474 | (21) |
| Antipyrine | $C_{11}H_{12}N_2O$ | 0.0530 | 0 | 1.18 | (21) |
| Resorcinol | $C_6H_6O_2$ | 0.0097 | 11 | 0.207 | (31) |
| | | 0.0100 | 16 | 0.206 | |
| Saccharin | $C_7H_5NO_3S$ | 0.0029 | 17 | 0.075 | (31) |

OSMOTIC PRESSURE OF COLLOIDS

| Substance | Wt. % | t, °C | mm Hg | Lit. |
|---|---|---|---|---|
| Dextrin | 1 | 15.9 | 166 | (43) |
| Gum arabic | 1 | 15.2 | 69 | (43) |
| | 6 | 15.5 | 259 | |
| | 18 | 15.6 | 1193 | |
| Egg albumen | 1.25 | room | 22.4 | (50) |
| Gelatin | 1.5 | room | 8.2 | (50) |
| Horse hemoglobin | 5.27 | room | 58.75 | (50) |
| Cow hemoglobin | 10.8 | room | 109.0 | (50) |
| Sodium caseinogenate | 3.23 | 25 | 313 | (5) |
| | 8.0* | 11 | 334 | (38) |
| Hemoglobins | | | | (1) |

* Solutions nearly neutral.

GELATIN, $t$ = 20°; COLLODION MEMBRANE (11)

| Gelatin | Wt. % | mm Hg |
|---|---|---|
| Dhéré and Gorgolewski | 0.152 | 1.00 |
| Sadikoff | 0.169 | 2.30 |
| Moerner | 0.232 | 7.9 |

GELATIN.—(*Continued*)

| Gelatin | Wt. % | mm Hg |
|---|---|---|
| Faust | 0.17 | 2.28 |
| Dryplate Sleussner | 0.17 | 2.86 |
| Technical 1 | 0.174 | 1.61 |
| 2 | 0.157 | 2.07 |
| 3 | 0.145 | 3.07 |
| 4 | 0.123 | 3.16 |
| 5 | 0.118 | 3.58 |

β-DEXTRIN, $t$ = 25°; COLLODION MEMBRANE (13)
Solubility 1.76% at 22°

| Wt. % | 0.0452 | 0.0818 | 0.158 | 0.321 | 0.513 |
|---|---|---|---|---|---|
| mm Hg | 5.70 | 8.24 | 12.7 | 15.8 | 18.7 |

DEXTRIN (KAHLBAUM PURIFIED), $t$ = 25°; COLLODION MEMBRANE (14)

| Wt. % | 0.076 | 0.125 | 0.268 | 0.445 | 0.663 | 1.02 | 1.675 |
|---|---|---|---|---|---|---|---|
| mm Hg | 3.47 | 5.75 | 8.1 | 10.4 | 12.3 | 13.1 | 15.0 |

For other dextrins, *see* (38).

CONGO RED, M. W., 696.5

| $t$ = 25° (15) | | $t$ = 25° (5) | | $t$ = 17° (18) | |
|---|---|---|---|---|---|
| M/1000 l | mm Hg | M/1000 l | mm Hg | M/1000 l | mm Hg |
| 0.306 | 7.07 | 1.12 | 24 | 4.97 | 88.7 |
| 0.619 | 13.5 | 2.23 | 45 | 5.13 | 89.0 |
| 0.907 | 17.3 | 4.46 | 106 | 6.15 | 106.0 |
| 1.25 | 27.6 | 8.93 | 176 | 7.05 | 120 |
| 1.59 | 33.2 | 17.86 | 326 | 8.10 | 145 |
| 1.87 | 42.1 | 35.7 | 625 | 10.05 | 171.7 |
| Initially against pure | | 55.6 | 1020 | 18.3 | 310 |
| water; collodion | | 71.4 | 1220 | 37.5 | 603 |
| membrane. | | | | 72.0 | 1139 |
| | | | | 86.6 | 1363 |
| | | Parchment membrane. Against pure water | | | |

Osmotic pressure of a solution of congo red at 28.5°, 123 mm Hg; at 62°, 138 mm Hg, parchment membrane (5)

| Chicago Blue, 25°; parchment | M/1000 l | 2.84 | 0.997 | Lit. |
|---|---|---|---|---|
| | $P_{osm.}$ mm Hg | 93 | 35 | (5) |

25°C, initially against pure water, collodion (12)

| Tuchrot G. A. | | Brilliantkongo | | Chicago Blue 6 B | | Kongoreinblau | |
|---|---|---|---|---|---|---|---|
| Wt. % | mm Hg | Wt. % | mm Hg | Wt. % | mm Hg | Wt. % | mm Hg |
| 0.013 | 3.3 | 0.027 | 6.1 | 0.023 | 7.8 | 0.028 | 8.6 |
| 0.0275 | 6.0 | 0.050 | 15.7 | 0.043 | 14.8 | 0.045 | 15.0 |
| 0.029 | 7.1 | 0.0475 | 18.4 | 0.045 | 15.6 | 0.073 | 26.5 |
| 0.0325 | 8.5 | 0.063 | 22.8 | 0.066 | 23.2 | 0.087 | 29.2 |
| 0.082 | 21.3 | 0.076 | 29.9 | 0.078 | 27.3 | | |
| 0.105 | 22.5 | | | | | | |

For results on benzopurpurine, primuline, and commercial dyes, *see* (5) and (12). For the effect of electrolytes on the osmotic pressure of dyestuffs, *see* (5, 12, 15, 18).

$Fe_2Cl_6 \cdot 140Fe_2O_3$ IRON HYDROXIDE SOL. (19)

| Wt. % | 0.15 | 0.20 | 0.40 | 0.80 | 1.84 |
|---|---|---|---|---|---|
| mm $H_2O$ | 2.0 | 5.5 | 20 | 70 | 220 |

THORIUM HYDROXIDE SOL.

| Wt. % | 0.40 | 0.56 | 0.97 | 1.75 | 2.70 | 4.03 |
|---|---|---|---|---|---|---|
| mm $H_2O$ | 2.5 | 13 | 47 | 115 | 240 | 430 |

Data are also given for copper ferrocyanide, prussian blue, gum arabic and dialyzed caramel.

### Osmotic Pressure of Electrolytes with Copper Ferrocyanide Membrane

| 0°C (8, 9) | |
|---|---|
| M/1000 | Atm. |
| Ca ferrocyanide | |
| 0.1024 | 2.54 |
| 0.2422 | 5.34 |
| 0.4182 | 9.20 |
| 0.6030 | 14.65 |
| 0.7470 | 20.33 |
| 1.075 | 41.22 |
| 1.353 | 70.84 |
| 1.469 | 87.09 |
| 1.617 | 112.84 |
| 1.711 | 130.66 |
| Mg ferrocyanide | |
| 0.2343 | 6.20 |
| 0.3241 | 8.70 |
| K ferrocyanide | |
| 0.0412 | 2.93 |
| 0.0824 | 5.41 |
| 0.1529 | 9.19 |
| 0.2416 | 13.52 |
| 0.3688 | 19.25 |
| Na ferrocyanide | |
| 0.0745 | 5.33 |
| 0.1163 | 7.83 |
| 0.1667 | 10.69 |
| 0.2305 | 14.23 |
| 0.2950 | 17.69 |
| Sr ferrocyanide | |
| 0.1596 | 3.40 |
| 0.3361 | 6.18 |
| 0.4642 | 8.59 |
| 0.6197 | 12.04 |
| α-Tetramethylammonium ferrocyanide | |
| 0.2686 | 5.96 |
| 2.152 | 52.32 |
| K ferricyanide | |
| 0.1215* | 7.58 |
| 0.5894* | 32.39 |
| 0.8509* | 47.61 |
| Ca ferricyanide | |
| 0.0365 | 2.56 |
| 0.0483 | 3.23 |
| 0.1232 | 8.68 |
| 0.1863 | 14.33 |

| 15°C (2) | |
|---|---|
| M/1000 l | Atm. |
| $H_2O$ | |
| $K_2SO_4$ | |
| 25.0 | 1.09 |
| 50.0 | 2.01 |
| $KNO_3$ | |
| 25.0 | 0.93 |
| 50.0 | 1.60 |
| 200.0 | 4.50 |
| KI | |
| 25.0 | 0.92 |
| 50.0 | 1.80 |
| 100.0 | 3.37 |

| 15°C (2) | |
|---|---|
| M/1000 l | Atm. |
| $KHCO_3$ | |
| 25.0 | 0.63 |
| 50.0 | 1.17 |
| 100.0 | 2.03 |
| $KClO_3$ | |
| 50.0 | 1.73 |
| $KC_2H_3O_2$ | |
| 50.0 | 1.26 |
| $K_2C_2O_4$ | |
| 25.0 | 1.31 |
| 50.0 | 2.26 |
| $KHSO_3$ | |
| 25.0 | 0.79 |
| $K_2C_4H_4O_6$ | |
| 25.0 | 1.17 |
| 50.0 | 2.30 |
| $K(SbO)C_4H_4O_6$ | |
| 25.0 | 0.75 |
| 50.0 | 1.35 |
| $KAl(SO_4)_2.12H_2O$ | |
| 12.5 | 1.08 |
| 25.0 | 2.04 |
| $KCr(SO_4)_2.12H_2O$ | |
| 12.5 | 1.10 |
| 25.0 | 2.27 |
| $K_4Fe(CN)_6$ | |
| 12.5 | 0.93 |
| 50.0 | 3.47 |
| $K_6Co_2(CN)_{12}$ | |
| 12.5 | 1.76 |
| 25.0 | 3.0 |
| K formate | |
| 50.0 | 1.25 |
| K acetate | |
| 50.0 | 1.54 |
| K propionate | |
| 50.0 | 1.62 |
| K benzoate | |
| 50.0 | 1.95 |
| K oxalate | |
| 50.0 | 2.26 |
| $NaNO_3$ | |
| 25.0 | 0.60 |
| 50.0 | 1.69 |
| 100.0 | 3.11 |
| $Na_2S_2O_3$ | |
| 50.0 | 2.21 |
| $Na_2HPO_4$ | |
| 25.0 | 1.50 |
| 50.0 | 1.82 |
| Na citrate | |
| 25.0 | 2.12 |
| 50.0 | 4.32 |
| $(NH_4)_2SO_4$ | |
| 25.0 | 1.30 |
| 50.0 | 2.64 |

* g-mol per l.

### Molecular Weights (M. W.) Calculated from Osmotic Pressures at Various Dilutions (1 M) (22)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| KCl (74.5) | Dil. | 1 | 2 | 4 | 6 | 12 | 24 |
| | M. W. | 240 | 105 | 97.5 | 88.9 | 84.6 | 82.7 |
| $CuSO_4$ (159) | Dil. | 1 | 2.49 | 4.15 | 8.30 | 16.60 | |
| | M. W. | 274 | 192 | 176 | 163 | 160 | |
| $BaCl_2$ (208.3) | Dil. | 1 | 5 | 10 | 20 | 40 | |
| | M. W. | 226 | 240 | 323 | 321 | 323 | |
| $K_2SO_4$ (174.4) | Dil. | 2 | 10 | 20 | 40 | 80 | |
| | M. W. | 160 | 97.3 | 68.5 | 64.5 | 61.7 | |

For the osmotic pressure of salt solutions, K and Na salts, nitrates, sulfates, salts of organic acids, alums, etc., *see* Adie (2), König and Hasenbaumer (30) and Pfeffer (43); for camphorates, naphthionates, benzenesulfonates, *o*-nitrobenzoates, silicofluorides, cobalticyanides and other salts, *see* Berkeley and Hartley (7). Adie's and Pfeffer's results are uncertain by several %; deviations between similar experiments often occur of the order of 10%. Those of Berkeley and Hartley (6, 7) show variations of 1–2%.

#### Additional Data

*Aqueous Solutions of Non-colloids.*—Antipyrine (42); electrolytes (25, 30); glycerol (42); mannitol (42); membranes of chemically inert substances (10); salicin (42); sucrose (3, 44, 48).

*Colloidal Solutions.*—Arsenious sulfide (33); gelatin (37); gums (37); hemoglobins (1, 26, 45); influence of electrolytes on osmotic pressure of colloids (32); proteins (34, 36, 47); serum proteins (46); starch (37).

#### Osmotic Pressures in Pyridine, 25°, Caoutchouc Membrane (29)

Values of theoretical (calc.) and observed osmotic pressures in cm Hg

| M/l | | 0.200 | 0.150 | 0.125 | 0.100 | 0.075 | 0.050 | 0.025 |
|---|---|---|---|---|---|---|---|---|
| Calc. | | 372 | 279 | 232 | 186 | 139 | 93 | 46 |
| Obs. | Sucrose | | 252 | 213 | 189 | 119 | 59 | 26 |
| | $AgNO_3$ | | 236 | 167 | 136 | 114 | | |
| | LiCl | 176 | 117 | | 82 | 76 | 50 | 17 |

#### Nitrocellulose in Acetone, 25°, Collodion Membrane (20)

| g/l | 1.16 | 3.65 | 8.33 | 18.8 | 46.2 | 67.2 | 106.3 | 141 |
|---|---|---|---|---|---|---|---|---|
| cm $H_2O$ | 0.62 | 2.68 | 8.0 | 25.4 | 105 | 210 | 502 | 963 |

#### Other Non-aqueous Solvents

Ether, water and glycerol mixtures (27).

Lithium chloride in ethyl alcohol with gutta percha membrane (4).

Pyridine solutions and caoutchouc membranes (17, 28, 49).

Rubber solutions (16).

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# THE PROPERTIES OF SURFACES: SURFACE TENSION, SURFACE ENERGY AND RELATED PROPERTIES

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# SURFACE TENSION AND CAPILLARITY: SYMBOLS AND ABBREVIATIONS

| Cgs Units Are Used Throughout | Partout usage des unités cgs | Das Cgs System wird durchwegs benützt | Vengono sempre usate le unità cgs |
|---|---|---|---|
| $\gamma$ Surface tension (or free surface energy).* | $\gamma$ Tension superficielle (ou énergie superficielle libre).* | $\gamma$ Oberflächenspannung (oder freie Oberflächenenergie).* | $\gamma$ Tensione superficiale (o energia libera superficiale).* |
| $\gamma_i$ Interfacial tension between two non-gaseous phases. | $\gamma_i$ Tension intersuperficielle entre deux phases non-gazeuses. | $\gamma_i$ Grenzflächenspannung zwischen zwei nicht gasförmigen Phasen. | $\gamma_i$ Tensione alla superficie di contatto tra due fasi non gassose. |
| $\Delta\gamma$ ($\gamma$ for a solution) $-$ ($\gamma$ for the pure solvent). | $\Delta\gamma$ ($\gamma$ pour une solution) $-$ ($\gamma$ pour le solvant pur). | $\Delta\gamma$ ($\gamma$ für eine Lösung) $-$ ($\gamma$ für ein reines Lösungsmittel). | $\Delta\gamma$ ($\gamma$ per la soluzione) $-$ ($\gamma$ per il solvente puro). |
| $\gamma_M$ Molecular free surface energy. | $\gamma_M$ Énergie superficielle libre moléculaire. | $\gamma_M$ Molekulare freie Oberflächenenergie. | $\gamma_M$ Energia libera molecolare di superficie. |
| $a^2$ Capillary constant or "specific cohesion." | $a^2$ Constante capillaire ou "cohésion spécifique." | $a^2$ Kapillaritätskonstante oder "spezifische Kohäsion." | $a^2$ Costante di capillarità o coesione specifica. |
| $d_l$ (resp. $d_v$) Density of the liquid (resp. of the saturated vapor). | $d_l$ (resp. $d_v$) Densité du liquide (resp. de la vapeur saturée). | $d_l$ (bezw. $d_v$) Dichte der Flüssigkeit (bezw. des gesättigten Dampfes). | $d_l$ (o $d_v$) Densità del liquido (o del vapore saturo). |
| $g$ Acceleration or intensity of gravity at place of observation. | $g$ Accélération ou intensité de la pesanteur au lieu de l'observation. | $g$ Beschleunigung oder Intensität der Schwerkraft am Standort der Beobachtung. | $g$ Accelerazione o intensità della gravità nel luogo di osservazione. |
| $h$ Effective height of capillary rise. | $h$ Hauteur effective de l'ascension capillaire. | $h$ Effektive Steighöhe. | $h$ Altezza effettiva dell'ascensione capillare. |
| $k_E$ The Eötvös constant. | $k_E$ Constante d'Eötvös. | $k_E$ Konstante nach Eötvös. | $k_E$ Costante di Eötvös. |
| $M$ Molecular weight, O = 16. | $M$ Poids moléculaire, O = 16. | $M$ Molekulargewicht, O = 16. | $M$ Peso molecolare, O = 16. |
| $n$ The van der Waals constant. | $n$ Constante de van der Waals. | $n$ van der Waals-Konstante. | $n$ Costante di van der Waals. |
| $r$ Internal effective radius of capillary. | $r$ Rayon interne effectif du tube capillaire. | $r$ Effektiver Innenradius der Kapillare. | $r$ Raggio interno del capillare. |
| $t_c$ (resp. $T_c$) Critical temperature. | $t_c$ (resp. $T_c$) Température critique. | $t_c$ (bezw. $T_c$) Kritische Temperatur. | $t_c$ (o $T_c$) Temperatura critica. |
| $x_A$ Mole fraction of substance A. | $x_A$ Fraction moléculaire de substance A. | $x_A$ Molenbruch des Stoffes A. | $x_A$ Frazione di grammimolecola della sostanza A. |

## EXPERIMENTAL METHODS

| Symbol | Methods | Symboles | Méthodes | Zeichen | Methoden | Simbolo | Metodi |
|---|---|---|---|---|---|---|---|
| (I) | Method of capillary height or pressure. | (I) | Ascension ou pression capillaire. | (I) | Steighöhe oder Kapillardruck. | (I) | Innalzamento oppure pressione capillare. |
| (II) | Drop-weight method. | (II) | Poids de la goutte. | (II) | Tropfengewicht. | (II) | Peso della goccia. |
| (III) | Method of maximum bubble pressure. | (III) | Pression maximum de la bulle. | (III) | Maximaldruck für Blasen. | (III) | Pressione massima della bolla. |
| (IV) | Method of capillary waves. | (IV) | Ondes capillaires. | (IV) | Kapillarwellen. | (IV) | Onde capillari. |
| (V) | Method of vibrating jet. | (V) | Jet vibrant. | (V) | Vibration. | (V) | Getto capillare. |
| (VI) | Drop-height method. | (VI) | Hauteur de la goutte. | (VI) | Tropfenhöhe. | (VI) | Altezza della goccia. |
| (VII) | Drop-shape method. | (VII) | Forme de la goutte. | (VII) | Tropfengestalt. | (VII) | Forma della goccia. |
| (VIII) | Method of maximum pressure in drops. | (VIII) | Pression maximum dans les gouttes. | (VIII) | Maximaldruck in Tropfen. | (VIII) | Massimo di pressione della goccia. |
| (IX) | Method of Sentis. | (IX) | Méthode de Sentis. | (IX) | Methode nach Sentis. | (IX) | Metodo di Sentis. |

* $\gamma$ alone means that the liquid or solution was studied in the presence of its own vapor only. $\gamma$ (air) means that air was present above the surface of the liquid and that, therefore, the liquid surface was in contact with air, saturated, of course, with the vapor of the liquid. $\gamma$ (air or vapor) means that some measurements were made under each of the above conditions and that the values given are for either within the limits prescribed. $\gamma$ ($H_2$), resp. ($N_2$), states the medium in which measurements were made, while $\gamma$ (?) indicates that the medium was not stated.

### EQUATIONS

Formula for capillary rise:

$$\gamma = \tfrac{1}{2}(d_l - d_g)ghr \text{ (}v.\ \textit{further}\text{ p. 435)} \quad (1)$$

Formula for capillary constant:

$$a^2 = \frac{\gamma}{\tfrac{1}{2}(d_l - d_g)g} \ (=hr \text{ for capillary rise}) \quad (2)$$

Formula of Eötvös:

$$\gamma_M = \gamma\left(\frac{M}{d_l}\right)^{2/3} = A_C - k_E t \text{(resp. } A_K - k_E T) \quad (3)$$

$A_C$ (resp. $A_K$) is a constant evaluated from the experimental data. For normal liquids this linear relation holds up to $t \gg t_c - 35°$. $A_C = k_E(t_c - 6)$ approximately, a relation which has found application as a means of computing $t_c$; $k_E = -\frac{d\gamma_M}{dt}$

Formula of van der Waals: $\gamma = \alpha\left(1 - \frac{T}{T_C}\right)^n$ (4)

$\alpha$ and $n$ are constants evaluated from the experimental data.

Formula of Macleod: $\gamma = K(d_l - d_v)^4$, where the constant $K$ is nearly independent of $T$ for normal liquids.

Formula of Sugden: $P = \frac{M}{d_l - d_v}\gamma^{1/4}$

$P = 0.78V_C$ approx. for certain normal liquids.

$V_C$ = molecular volume in cm³ at the critical temperature.

# TENSILE STRENGTH AND ANGLE OF CONTACT

T. Fraser Young and William D. Harkins

### TENSILE STRENGTH AND TENSILE ENERGY

The free tensile energy of a liquid is defined as equal to $2\gamma$. It is the reversible work done on the system (increase of free energy) to rupture a bar of liquid of one cm² cross section to form two plane surfaces of 1 cm² area each. The total tensile energy ($e_t$) per cm² is given by the relation: $e_t = 2(\gamma + l) = 2h$, ($l$ = latent heat, $h$ = surface energy of unit surface).

It has not been found possible to measure the tensile strength of a liquid, since the rupture does not occur simultaneously over more than a minute area. The maximum value of the pull which has thus far been attained, is given below:

Maximum negative pressure in megabaryes (13): $H_2O$ = 34 at 24.4°C; $C_2H_5OH$ = 40 at 22.5°C; $(C_2H_5)_2O$ = 73 at 17.7°C.

The pull necessary to rupture a film of various liquids between two flat steel surfaces of contact, 4.5 cm² in area, has been found to be as large as 3–4 megabaryes, but this is probably much lower than that corresponding to the true tensile strength of the liquid (4).

### ANGLE OF CONTACT

The angle of contact ($\theta$) between the surface of a liquid and that of a solid is highly dependent upon the nature of the surfaces, and is in general different for contaminated surfaces from what it is for clean surfaces. In few of the experiments in which $\theta$ has been determined has cleanliness of the surface of the liquid been demonstrated, and the difficulty of cleaning the surface of a solid is so great that no experiments with what may be called pure surfaces have been carried out with solids.

By use of various optical methods it has been shown (Table 1) that $\theta$ between glass and a small number of liquids is zero provided the glass is already covered by a film of the liquid. $\theta$ may be greater than zero provided the liquid is evaporating (14), or the glass surface has become dry (15).

Table 1.—Angle of Contact ($\theta$) between Liquid and Glass Covered with a Film of the Liquid at Room Temperature as Determined by Various Optical Methods

| Liquid | $\theta$ | Lit. |
|---|---|---|
| Water | 0 | (1, 3, 14, 15) |
| Ethyl alcohol | 0 | (14) |
| Benzene | 0 | (14) |
| Carbon tetrachloride | 0 | (14) |
| Chloroform | 0 | (14) |
| Acetic acid | 0 | (3) |
| Aqueous solutions of various salts | 0 | (15) |
| Glycerol | 0 | (1) |
| Ethyl ether | 0 | (3, 14) |
| Turpentine | 0 | (1, 3) |
| Olive oil | 0 | (1) |
| Hydrogen peroxide | 0 | (12) |

That $\theta$ for liquid-to-glass is zero within the limits of error of the methods employed is indicated in the case of about 100 other liquids by the data used in compiling these tables, which show that the surface tension determined by the capillary-height method on the basis of the assumption that $\theta$ is zero, is the same for each of these liquids as the value obtained by the drop-weight method by the use of the corrections of Harkins and Brown or by the bubble-pressure method by the use of the corrections of Sugden. In addition Volkmann (16) found $a^2$ for $H_2O$ = constant ± 0.0002 at 20.2°C for seven different kinds of glass and Carver and Hovorka (5) found $a^2$ for $H_2O$ = constant ± 0.0002 at 20° for glass, zinc, copper and silver.

Table 2.—Angle of Contact Greater than Zero

| Interface | $t$, °C | $\theta$, °arc | Lit. |
|---|---|---|---|
| $H_2O$—azobenzene | 14 | 77° | (3) |
| $H_2O$—paraffin | 14 | 106° 43′ | (3) |
| Hg—glass | 4.4 | 144.48° | (2) |
| | 3 | 148.28° | |
| | 4 | 147.71° | |
| | 3 | 140.00° | |
| | 9 | 139.41° | (2) |
| | 16 | >139° | (1) |
| | 18 | 128° | (8) |
| $H_2O$—various plates coated with oleic acid | | | (11) |
| $H_2O$—plates coated with 65 different organic compounds | | | (18) |

For angle of contact of a lens of $H_2O$ on $CCl_4$, *v.* (6).

It should be noted that in cases where the last terms of the Laplace-Poisson equation (*v.* (2), p. 8)

$$h = a\sqrt{2}\sin\frac{\theta}{2} - \frac{a^2}{\mu} + \frac{a^2}{3r'\sin\frac{\theta}{2}}\left(1 - \cos^3\frac{\theta}{2}\right)$$

are not used, the values of $\theta$ given are often 5 or more degrees in error; $r' = r + (\sqrt{2} - 1)a$; $h$ is approximate thickness of a drop of liquid of horizontal radius $r$ which lies on a horizontal plane plate; $\mu$ is its radius of curvature.

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(For a key to the periodicals see end of volume)

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# METHODS OF MEASURING SURFACE TENSION

T. Fraser Young and William D. Harkins

For critical discussion of various methods, their sources of error, corrections, precautions, etc., *see* especially (3, 4, 5, 6, 14); *cf.* (7) and the references cited below.

The *Capillary-Height Method.*

$$2\pi r\gamma = V(d_1 - d_2)g/\cos\theta,$$

in which $d_1$ is the density of the fluid of greater density and $d_2$ is the density of the other fluid; $V$ is the volume which lies inside a capillary tube of uniform bore, between the small meniscus and the level of a horizontal plane which lies in the surface of the (extremely) large meniscus.

$$V = \pi r^2 h,$$

in which $h$ may be considered as the average vertical distance between the two surfaces. If $h_0$ is the vertical distance between the plane of the large meniscus and a horizontal plane tangent to the small meniscus, then for capillary tubes of very small diameter ($< 1$ mm for $H_2O$):

$$h = h_0 + \frac{r}{3} - 0.1288\frac{r^2}{h_0} + 0.1312\frac{r^3}{h_0^2} \text{ (Poisson, Rayleigh)}$$

or approximately

$$h = h_0 + \frac{a^2 r}{3a^2 + r^2} \text{ (Hagen and Desains)}$$

This expression is not equivalent to that given by Rayleigh.

For tubes of considerably larger diameter $\left(\frac{r}{a} > 4.3\right)$,

$$1.4142\frac{r}{a} - \log_e\frac{a}{h_0} = 0.6648 + 0.19785\frac{a}{r} + \frac{1}{2}\log_e\frac{r}{a} \text{ (Rayleigh)}$$

For tubes of intermediate diameters neither equation is accurate and the tables of Bashforth and Adams (1) should be used to obtain $h$. *See further* (2, 5, 11, 12, 15).

*Drop-Weight Method.*

$$\gamma = \frac{mg}{r} \times F,$$

$m$ is the mass of a slowly formed drop which falls from a horizontal tip of circular cross-section (radius $= r$) and sharp edge. $F$ is a function of $V/r^3$, where $V$ is the volume of the drop, and its value may be interpolated from the following table (for theory, *v.* (9)).

Experimental Values for Drop Weight Corrections (5)

| $V/r^3$ | $F$ | ± % | $V/r^3$ | $F$ | ± % |
|---|---|---|---|---|---|
| ∞ | 0.159 | | 2.3414 | 0.26350 | 0.1 |
| 5000 | 0.172 | | 2.0929 | 0.26452 | 0.05 |
| 250 | 0.198 | | 1.8839 | 0.26522 | 0.05 |
| 58.1 | 0.215 | | 1.7062 | 0.26562 | 0.05 |
| 24.6 | 0.2256 | | 1.5545 | 0.26566 | 0.05 |
| 17.7 | 0.2305 | 0.3 | 1.4235 | 0.26544 | 0.05 |
| 13.28 | 0.23522 | 0.25 | 1.3096 | 0.26495 | 0.1 |
| 10.29 | 0.23976 | 0.2 | 1.2109 | 0.26407 | 0.1 |
| 8.190 | 0.24398 | 0.15 | 1.124 | 0.2632 | 0.15 |
| 6.662 | 0.24786 | 0.15 | 1.048 | 0.2617 | 0.15 |
| 5.522 | 0.25135 | 0.15 | 0.980 | 0.2602 | 0.15 |
| 4.653 | 0.25419 | 0.15 | .912 | 0.2585 | 0.15 |
| 3.975 | 0.25661 | 0.15 | .865 | 0.2570 | 0.2 |
| 3.433 | 0.25874 | 0.15 | .816 | 0.2550 | |
| 2.995 | 0.26065 | 0.15 | .771 | 0.2534 | |
| 2.637 | 0.26224 | 0.1 | .729 | 0.2517 | |
| 0.692 | 0.2499 | | 0.541 | 0.2430 | |
| .658 | 0.2482 | | .512 | 0.2441 | |
| .626 | 0.2464 | | .483 | 0.2460 | |
| .597 | 0.2445 | | .455 | 0.2491 | |
| .570 | 0.2430 | | .428 | 0.2526 | |
| | | | .403 | 0.2559 | |

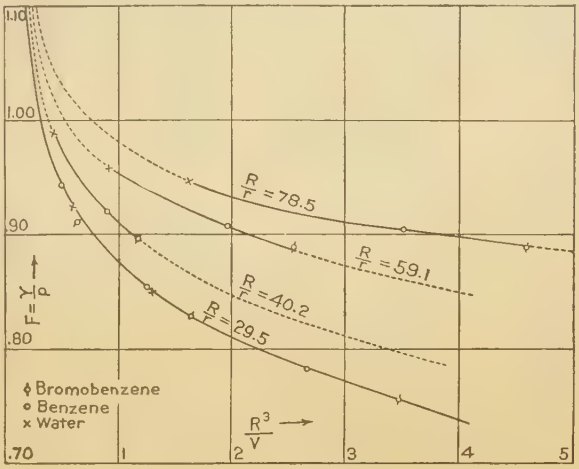


Fig. 1.

*Method of Maximum Pull on a Ring.*—When a circular ring of radius $R$ (center of ring to center of wire) is pulled from the surface of a not-too-viscous liquid into the gas phase above, the surface tension is given by

$$\gamma = p \times F,$$

where $p$ is the pull in dyne/cm and $F$ is a function of $R^3/V$ whose value may be interpolated from Fig. 1 for any ring of radius $R$ constructed from a wire of radius $r$. $V$, the volume of the liquid lifted by the ring $= \frac{p}{g(d_l - d_g)}$, where $d_l$ is the density of the liquid and $d_g$ that of the gas above it (8, 10, 13).

*Other Methods.*—*v.* (3, 4, 7, 14).

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(For a key to the periodicals see end of volume)

(1) Bashforth and Adams, *An Attempt to Test the Theories of Capillary Action.* Cambridge Univ. Press, 1883. (2) Desains, *6*, **51**: 385; 57. (3) Dorsey, *31* No. **540**; 26. (4) Ferguson, *83*, **17**: 370; 22. *Science Progress*, **9**: 428; 15. *133*, *Fifth Report on Colloids, etc.*, **1923**: 1. (5) Harkins and Brown, *1*, **41**: 499; 19. (6) Harkins and Humphery, *1*, **38**: 236; 16. (7) Harkins and Young, *Surface Energy and Colloidal Systems.* New York, Chemical Catalog Co., *O.* (8) Harkins, Young and Cheng, *166*, **64**: 333; 26. (9) Lohnstein, *8*, **20**: 237, 606; 06. **21**: 1030; 06. *7*, **64**: 686; 08. **84**: 410; 13.
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# INTERFACIAL TENSION FOR SOLID-LIQUID AND LIQUID-LIQUID INTERFACES

T. Fraser Young and William D. Harkins

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## INTERFACE, SOLID—LIQUID

Free surface energy at the interface solid—liquid

No method has as yet been discovered for the determination of the free interfacial energy between a solid and a liquid. For values calculated from the Ostwald-Freundlich equation, *v.* (5, 25). *See further* (1, 2, 7, 9, 25, 26, 34).

## INTERFACE, LIQUID—LIQUID

**Abbreviations**; *see also* p. 433

$\gamma_i$ Interfacial tension, cgs.

$\gamma$ Surface tension of organic liquid, cgs.

$d_p$ (resp. $d_o$ and $d_w$) Density of pure organic liquid (resp. the organic phase, and the aqueous phase), g/cm³.

Except where otherwise noted all values recorded below were obtained by the drop-weight method.

*Accuracy.*—No attempt has been made to estimate accuracy except in cases where independent determinations with different samples are available. The attainable precision by the drop-weight method appears to be about 0.1 % at a water interface and 1 % at a mercury interface. Other methods have thus far yielded considerably less accurate results.

The interfacial tension at the phase boundary liquid—liquid is in general varied much more by impurities than the surface tension at the liquid—gas interface. It is not yet known how well the drop-weight method applies to the determination of $\gamma_i$ at the liquid—liquid interface since the corrections were determined under the somewhat different conditions existing at the liquid—gas interface.

**Interface, Water—Organic Liquid: C-Table, The C-Arrangement**

| Formula | Name | $\gamma_i$ | $\gamma$ (air) | $d_p$ | $d_o$ | $d_w$ | $t$, °C | Lit. |
|---|---|---|---|---|---|---|---|---|
| $CCl_4$ | Carbon tetrachloride* | 45.0±1.0 | 26.66 | 1.590 | 1.5846 | 0.9972 | 20 | (12) |
| $CS_2$ | Carbon disulfide | 48.36 | 31.38 | 1.261 | 1.2596 | 0.9972 | 20 | (12) |
| $CHBr_3$ | Bromoform | 40.85 | 41.53 | 2.8854 | 2.8818 | 1.0004 | 20 | (16) |
| $CHCl_3$ | Chloroform | 32.80±0.2 | 27.13 | 1.485 | 1.4831 | 1.0002 | 20 | (12, 19) |
| $CH_2Cl_2$ | Methylene chloride | 28.31 | 26.52 | 1.3478 | 1.3286 | 1.0018 | 20 | (12) |
| $CH_2I_2$ | Methylene iodide | 48.50 | 50.76 | 3.3190 | 3.3180 | 0.99908 | 20 | (16) |
| $CH_3NO_2$ | Nitromethane | 9.66 | 36.82 | 1.1385 | 1.1288 | 1.0184 | 20 | (12) |
| $C_2Cl_4$ | Tetrachloroethylene | 47.48 | 31.74 | 1.6216 | 1.6219 | 0.99844 | 20 | (16) |
| $C_2H_2Br_4$ | Acetylene tetrabromide | 38.82 | 49.67 | 2.9620 | 2.9588 | 0.9986 | 20 | (12) |
| $C_2H_4Br_2$ | Ethylene dibromide* | 36.54 | 38.71 | 2.178 | 2.1773 | 0.9991 | 20 | (12) |
| $C_2H_5Br$ | Ethyl bromide | 31.20 | 24.16 | 1.441 | 1.4460 | 1.0001 | 20 | (12) |
| $C_2H_5I$ | Ethyl iodide | 40.0 | 29.9 | | | | 16 | (8, 10) |
| $C_2H_6S$ | Ethylmercaptan | 26.12 | 21.82 | | | 0.9982 | 20 | (12) |
| $C_3H_4Cl_2O$ | 1, 1-Dichloroacetone | 14.43 | 31.91 | 1.236 | | 1.0170 | 20 | (12) |
| $C_3H_5Br_3$ | 1, 2, 3-Tribromopropane | 38.50 | 45.36 | 2.4171 | 2.4152 | 0.99892 | 20 | (16) |
| $C_3H_5ClO$ | Chloroacetone | 7.11 | 35.27 | 1.170 | 1.1581 | 1.0029 | 20 | (12) |
| $C_4H_7N$ | Butyronitrile | 10.38 | 28.06 | 0.79040 | 0.99426 | 0.99201 | 20 | (12) |
| $C_4H_8Cl_2S$ | $\beta$, $\beta'$-Dichloroethyl sulfide | 28.36 | 42.82 | 1.2732 | | | 20 | (14) |
| $C_4H_9Cl$ | Isobutyl chloride | 24.43 | 21.94 | 0.8754 | 0.8766 | 0.9973 | 20 | (12) |
| $C_4H_9Cl$ | *tert.*-Butyl chloride | 23.75 | 19.59 | 0.8422 | 0.8423 | 0.9990 | 20 | (12) |
| $C_4H_{10}O$ | Isobutyl alcohol | 2.1 | | | 0.8424 | 0.9834 | 18 | (1.5) |
| $C_4H_{10}O$ | Ethyl ether | 10.70±0.2 | 17.10 | | 0.7174 | 0.9868 | 20 | (12) |
| $C_5H_9N$ | Isovaleronitrile | 14.14 | 26.03 | 0.79106 | 0.79294 | 0.99622 | 20 | (12) |
| $C_5H_{10}$ | Trimethylethylene | 36.69 | 17.26 | | | | 20 | (12) |
| $C_5H_{10}O$ | Methyl propyl ketone | 6.28 | 24.15 | 0.8067 | 0.8125 | 0.9897 | 20 | (12) |
| $C_5H_{10}O_2$ | Isovaleric acid | 2.73 | 25.33 | 0.9295 | 0.9457 | 0.9998 | 20 | (12) |
| $C_5H_{10}O_3$ | Diethyl carbonate | 12.86 | 26.31 | | 0.97513 | 0.99905 | 20 | (12) |
| $C_5H_{11}Cl$ | Isoamyl chloride | 15.44 | 23.48 | 0.86962 | 0.87146 | 0.9955 | 20 | (12) |
| $C_5H_{12}$ | Isopentane | 49.64 | 13.72 | 0.6200 | 0.6198 | 0.9982 | 20 | (12) |
| $C_5H_{12}O$ | Amyl alcohol (inactive mixt.) (I) | 4.9±2.0 | | | 0.804 | | 30 | (33) |
| $C_5H_{12}O$ | Isoamyl alcohol | 5.0 | | | 0.8291 | 0.9952 | 18 | (1.5) |
| $C_6H_5Br$ | Bromobenzene | 39.82 | 36.26 | 1.5016 | 1.5013 | 0.99862 | 20 | (16) |
| $C_6H_5Cl$ | Chlorobenzene | 37.41 | 33.08 | 1.053 | 1.1047 | 0.9972 | 20 | (12) |
| $C_6H_5I$ | Iodobenzene | 45.67 | 40.35 | | | | 16.8 | (8, 10, 16) |
| | | 41.84 | 39.70 | 1.8258 | 1.8255 | 0.99832 | 20 | |
| $C_6H_5NO_2$ | Nitrobenzene | 25.66 | 43.38 | | 1.2012 | 0.9976 | 20 | (12) |
| $C_6H_6$ | Benzene* | 35.00±0.05 | 28.86 | | 0.8788 | 0.9980 | 20 | (10, 11, 12, 13, 22) |
| $C_6H_7N$ | Aniline | 5.77 | 42.58 | 1.022 | 1.216 | 0.9990 | 20 | (12) |
| $C_6H_{12}O$ | Cyclohexanol | 3.92 | 34.23 | | | | 16.2 | (8, 10) |
| $C_6H_{12}O$ | Ethyl propyl ketone | 13.58 | 25.39 | 0.8152 | 0.8152 | 0.9964 | 20 | (12) |

| Formula | Name | $\gamma_i$ | $\gamma$ (air) | $d_p$ | $d_o$ | $d_w$ | $t$, °C | Lit. |
|---|---|---|---|---|---|---|---|---|
| $C_6H_{12}O$ | Methyl butyl ketone | 9.73 | 25.49 | 0.8124 | 0.8160 | 0.9956 | 20 | (12) |
| $C_6H_{12}O$ | Methyl *tert.*-butyl ketone | 10.81 | 23.43 | 0.8055 | 0.8090 | 0.9954 | 20 | (12) |
| $C_6H_{14}$ | *n*-Hexane* | 51.10±0.2 | 18.43 | 0.6595 | 0.6597 | 0.9972 | 20 | (12) |
| $C_6H_{15}N$ | Dipropylamine | 1.66 | 22.54 | 0.73853 | 0.81620 | 0.98844 | 20 | (12) |
| $C_7H_5NS$ | Phenyl isothiocyanate | 39.04 | 41.44 | 1.1326 | 1.1331 | 0.99795 | 20 | (16) |
| $C_7H_6O$ | Benzaldehyde | 15.51 | 40.04 | 1.0504 | 1.0445 | 0.9981 | 20 | (12) |
| $C_7H_7Br$ | *o*-Bromotoluene | 41.15 | 35.85 | 1.4218 | 1.4318 | 0.99823 | 20 | (16) |
| $C_7H_7NO_2$ | *o*-Nitrotoluene | 27.19 | 41.46 | 1.168 | 1.1599 | 0.9972 | 20 | (12) |
| $C_7H_7NO_2$ | *m*-Nitrotoluene | 27.68 | 40.99 | 1.168 | 1.1547 | 0.9971 | 20 | (12) |
| $C_7H_8$ | Toluene | 36.1 | | | | | 25 | (37) |
| $C_7H_8O$ | Anisole | 25.82 | 35.22 | 0.99327 | 0.99270 | 0.99715 | 20 | (12) |
| $C_7H_8O$ | Benzyl alcohol | 4.75 | 39.71 | | | | 22.5 | (8, 10) |
| $C_7H_{14}O_2$ | Heptylic acid* | 7.00±0.5 | 28.31 | | | | 20 | (11, 12) |
| $C_7H_{14}O_2$ | Ethyl isovalerate | 18.39 | 23.68 | 0.8648 | 0.8658 | 0.9971 | 20 | (12) |
| $C_8H_8$ | Styrene | 35.48 | 32.14 | | | | 19.0 | (8, 10) |
| $C_8H_{10}$ | Ethylbenzene | 31.35 | 29.62 | | | | 17.5 | (8, 10) |
| $C_8H_{10}$ | *o*-Xylene | 36.06 | 29.89 | 0.87810 | 0.87806 | 0.99707 | 20 | (12) |
| $C_8H_{10}$ | *p*-Xylene | 37.77 | 28.33 | 0.86444 | 0.86494 | 0.99680 | 20 | (12) |
| $C_8H_{10}O$ | Phenetole | 29.40 | 32.74 | 0.96474 | 0.96474 | 0.99820 | 20 | (12) |
| $C_8H_{16}O$ | Methyl hexyl ketone | 14.09 | 26.79 | 0.8192 | 0.8205 | 0.9980 | 20 | (12) |
| $C_8H_{16}O_2$ | Caprylic acid | 8.217 | 28.82 | | | | 18.1 | (8, 10) |
| $C_8H_{16}O_2$ | Ethyl caproate* | 19.80±2 | 25.81 | | 0.8705 | 0.9973 | 20 | (19) |
| $C_8H_{18}$ | *n*-Octane* | 50.81±0.1 | 21.77 | 0.7022 | 0.7021 | 0.9971 | 20 | (12) |
| $C_8H_{18}O$ | *n*-Octyl alcohol* | 8.52±0.2 | 27.53 | 0.8252 | 0.8301 | 0.9981 | 20 | (12) |
| $C_8H_{18}O$ | Methylhexyl carbinol | 9.42±0.2 | 26.52 | 0.8211 | 0.8257 | 0.9974 | 20 | (12) |
| $C_8H_{19}N$ | Diisobutylamine | 10.28 | 22.05 | 0.74428 | 0.74763 | 0.99680 | 20 | (12) |
| $C_9H_{12}$ | Mesitylene | 38.70 | 28.51 | 0.86124 | 0.86140 | 0.99717 | 20 | (12) |
| $C_9H_{18}O_2$ | Isoamyl butyrate | 23.00 | 25.19 | 0.86272 | 0.86280 | 0.99672 | 20 | (12) |
| $C_{10}H_7Br$ | α-Bromonaphthalene | 42.07 | 44.59 | 1.4836 | 1.4739 | 0.99828 | 20 | (16) |
| $C_{10}H_7Cl$ | α-Chloronaphthalene | 40.74 | 41.80 | 1.1706 | 1.1700 | 0.9982 | 20 | (16) |
| $C_{10}H_{14}$ | *p*-Cymene | 34.61 | 28.09 | 0.85618 | 0.85630 | 0.99702 | 20 | (12) |
| | | 39.41 | 28.75 | | | | 13.50 | (8, 10) |
| $C_{10}H_{22}$ | Diisoamyl | 46.80 | 22.24 | 0.72216 | 0.72253 | 0.99696 | 20 | (12) |
| $C_{10}H_{23}N$ | Diisoamylamine | 13.51 | | | 0.77628 | 0.99815 | 20 | (19) |
| $C_{11}H_{12}O_2$ | Ethyl cinnamate | 21.36 | 38.42 | | | | 19.5 | (8, 10) |
| $C_{11}H_{14}O_2$ | Ethyl hydrocinnamate | 20.19 | 35.08 | | | | 21.5 | (8, 10) |
| $C_{11}H_{20}O_2$ | Undecylenic acid | 10.14 | 30.64 | 0.90604 | 0.90762 | 0.99610 | 25 | (12) |
| $C_{11}H_{22}O_2$ | Ethyl nonylate | 23.88 | 28.04 | | | | 20 | (12) |
| $C_{12}H_{14}O_4$ | Diethyl phthalate | 16.27 | 37.34 | | | | 20.5 | (8, 10) |
| $C_{18}H_{34}O_2$ | Oleic acid | 15.59±0.2 | 32.50 | | | | 20 | (10, 12*) |
| | | 15.68† | 32.50 | 0.8910 | 0.8908 | 0.9982 | 20 | |
| $C_{18}H_{34}O_3$ | Ricinoleic acid | 14.25 | 35.81 | | | | 16 | (8, 10) |
| $C_{20}H_{38}O_2$ | Ethyl oleate‡ | 21.34 | | | 0.87601 | | 20 | (19) |

* Between 10 and 40°C, the $\gamma_i$ temperature coefficients of the following liquids are approximately constant: $d\gamma_i/dt$ for $CCl_4$ = −0.098; for $C_2H_4Br_2$ = −0.108; for $C_6H_6$ = −0.058; for $C_6H_{14}$ = −0.026; for $C_7H_{14}O_2$ = −0.037; for $C_8H_{18}$ = −0.048; for $C_5H_{12}O$ = +0.039; for *sec.*-$C_8H_{18}O$ = +0.041 (11). For ethyl caproate and heptaldehyde, *v.* (11).

† The oleic acid and water were mixed with each other but were not mutually saturated (12).

‡ A sample of Kahlbaum's ethyl oleate gave $\gamma_i$ = 18.7 at 20°, but contained an amount of free acid equivalent to 1.65 % oleic acid.

**Interface, Aqueous Solution—Organic Liquid**

$CCl_4$; 22±2°C (28)

| Salt | $C$* | $\Delta\gamma_i$† | Method | Salt | $C$* | $\Delta\gamma_i$† | Method |
|---|---|---|---|---|---|---|---|
| $FeCl_3$ | 0.1 | 0.9 | I | KBr | 0.1 | 0.8 | II |
| | 1.0 | −0.1 | I | | 1.0 | 1.7 | II |
| $MgSO_4$ | 0.1 | −1.2 | I | KI | 0.1 | 1.1 | II |
| | 1.0 | −2.4 | I | | 1.0 | 0.8 | II |
| $CaCl_2$ | 0.1 | 0.4 | I | $K_2SO_4$ | 0.1 | 0.6 | II |
| | 1.0 | 2.3 | I | | 0.5 | 0.9 | II |
| NaCl | 0.1 | 1.0 | I | | 1.0 | 1.5 | II |
| | 1.0 | 2.3 | I | | 0.1 | 0.2 | I |
| NaBr | 0.1 | 0.5 | II | | 1.0 | 0.1 | I |
| | 1.0 | 0.8 | II | KCNS | 0.1 | 0.9 | II |
| KCl | 0.1 | 0.5 | I | | 1.0 | −0.8 | II |
| | 1.0 | 2.1 | I | Also $\gamma_i$ for aqueous $H_2SO_4$, | | | |
| | 0.1 | 0.1 | II | and for mixtures of KCl and | | | |
| | 1.0 | 1.5 | II | KCNS in water. | | | |

$CHCl_3$; 22 ± 2°C (28)

| Salt | $C$* | $\Delta\gamma_i$† | Method | Salt | $C$* | $\Delta\gamma_i$† | Method |
|---|---|---|---|---|---|---|---|
| $FeCl_3$ | 0.1 | 2.9 | I | KBr | 0.1 | 1.4 | II |
| | 1.0 | 3.5 | I | | 1.0 | 1.3 | II |
| $MgSO_4$ | 0.1 | 3.2 | I | KI | 0.1 | 1.1 | II |
| | 1.0 | 2.6 | I | | 1.0 | 0.2 | II |
| $CaCl_2$ | 0.1 | 2.5 | I | $K_2SO_4$ | 0.1 | 3.2 | I, II |
| | 1.0 | 2.6 | I | | 1.0 | 1.4 | I |
| NaCl | 0.1 | 2.8 | I | | 0.1 | 3.2 | II |
| | 1.0 | 3.6 | I | | 0.5 | 4.7 | II |
| NaBr | 0.1 | 1.1 | II | | 0.75 | 3.2 | II |
| | 1.0 | 0.0 | II | | 1.0 | 2.4 | I, II |
| KCl | 0.1 | 3.0 | I | KCNS | 0.1 | 1.2 | II |
| | 1.0 | 4.0 | I | | 1.0 | −0.4 | II |
| | 0.1 | 1.6 | II | * $C$ = M/l$_0$. † ±2. | | | |
| | 1.0 | 1.8 | II | | | | |

| Salt | M/$l_s$ | $\Delta\gamma_i$ ±2 | Method |
|---|---|---|---|
| $C_4H_{10}O$, Ethyl ether; 22 ± 2° (28) | | | |
| $H_2SO_4$ | 0.2 | 0.2 | II |
| | 2.0 | 0.4 | II |
| $FeCl_3$ | 0.1 | 0.7 | II |
| | 1.0 | 1.2 | II |
| $MgSO_4$ | 0.1 | 0.8 | II |
| | 1.0 | 1.6 | II |
| $CaCl_2$ | 0.1 | 0.8 | II |
| | 1.0 | 2.2 | II |
| NaCl | 0.1 | 0.2 | I |
| | 0.5 | 0.8 | I |
| | 1.0 | 1.0 | I |
| NaBr | 0.1 | 0.2 | II |
| | 1.0 | 1.5 | II |
| KCl | 0.1 | 0.7 | I |
| | | 0.4 | II |
| | 1.0 | 1.4 | I |
| | | 1.7 | II |
| KBr | 0.1 | 0.3 | II |
| | 1.0 | 1.4 | II |
| KI | 0.1 | −0.7 | II |
| | 1.0 | −1.5 | II |
| $K_2SO_4$ | 0.1 | 0.3 | II |
| | 1.0 | 1.3 | II |
| KCNS | 0.1 | −0.6 | II |
| | 1.0 | −1.8 | II |
| $C_6H_5NO_2$, Nitrobenzene; 22 ± 2° (28) | | | |
| $H_2SO_4$ | 0.1 | 0.2 | II |
| | 0.2 | 0.1 | II |
| | 0.5 | 0.1 | II |
| | 1.0 | −0.1 | II |
| | 2.0 | −0.4 | II |
| $FeCl_3$ | 0.1 | 0.6 | I |
| | 1.0 | 0.9 | I |
| $MgSO_4$ | 0.1 | 0.4 | I |
| | 1.0 | 0.4 | I |
| $CaCl_2$ | 0.1 | 0.5 | I |
| | 1.0 | 1.1 | I |
| NaCl | 0.1 | 0.0 | I |
| | 1.0 | 1.9 | I |
| NaBr | 0.1 | 0.0 | II |
| | 1.0 | 0.3 | II |
| KCl | 0.1 | 0.7 | I |
| | 1.0 | 1.7 | I |
| | 0.1 | 0.2 | II |
| | 1.0 | 0.8 | II |
| KBr | 0.1 | 0.3 | II |
| | 1.0 | 0.2 | II |
| KI | 0.1 | 0.1 | II |
| | 1.0 | −1.6 | II |
| $C_6H_5NO_2$.—(*Continued*) | | | |
| $K_2SO_4$ | 0.1 | 1.1 | I |
| | 1.0 | 1.1 | I |
| | 0.1 | 0.1 | II |
| | 1.0 | 0.2 | II |
| KCNS | 0.1 | −0.3 | II |
| | 1.0 | 3.1 | II |
| $C_2H_3Cl_3O_2$, Chloral-hydrate | 0.5* | −0.9 | I |
| | 1.0* | −2.9 | I |
| | 2.0* | −4.0 | I |

* Wt. %.

$C_4H_8Cl_2S$, $\beta,\beta'$-Dichloroethyl sulfide; 20°C; $d_4^{20}$ = 1.2732 (I) (14). Phases not mutually saturated.

| | $d_w$ | $\gamma_i$ |
|---|---|---|
| Vapor | | 42.82 |
| Water | 0.9982 | 28.36 |
| 0.1*N* HCl | 1.0001 | 28.90 |
| 0.1*N* NaOH | 1.0032 | 12.78 |
| 0.1*N* $Na_2CO_3$ | 1.0025 | 18.82 |

$C_5H_{11}NO_3$, Isoamyl nitrate against 0.177*N* KCl (II) (12)

| $\gamma_i$ | $\gamma$ | $d_p$ |
|---|---|---|
| 30.80 | 27.18 | 0.99710 |
| $d_o$ | $d_w$ | $t$ |
| 0.99745 | 1.0059 | 20 |

$C_6H_6$, Benzene

1% aq. soln. chloral hydrate at 22 ± 2° (I), $\Delta\gamma_i$ = −3.6 (28).

Aq. soln. of NaCl at 25 ± 0.01°C (II) (16.5)

| M/$l_s$ | $\Delta\gamma_i$ ± 0.2 |
|---|---|
| 0.3 | 0.63 |
| 0.5 | 0.86 |
| 1.0 | 1.56 |
| 3.0 | 4.04 |
| 5.0 | 6.59 |

Aq. solutions of acids: acetic (18); butyric (17.5).

Dimethylaniline + benzene or heptane, against water (31).

Interfacial tensions and distributions for the two-phase system, butyric acid + hexane + $H_2O$ (18).

$C_8H_{18}O$, Caprylic alcohol

For the pure alcohol, $\gamma$ = 26.35, relative viscosity = 3.126, $d_4^{25}$ = 0.82026, 25° (4)

| Solution | Wt. % | $\gamma_i$ |
|---|---|---|
| Water | 0.0 | 9.80 |
| Sucrose | 30.0 | 10.88 |
| Dextrin | 10.0 | 3.85 |
| Starch | 1.0 | 10.17 |
| Gum arabic | 10.0 | 9.24 |

$C_{18}H_{34}O_2$, Oleic acid against 0.116*N* HCl (II) (12)

| $\gamma_i$ | $d_p$ | $d_o$ | $d_w$ | $t$ |
|---|---|---|---|---|
| 15.99 | 0.8910 | 0.8908 | 1.0006 | 20 |

Benzene against aqueous soap solutions (II); sodium oleate (13); effects of oleic acid and of NaOH (22); *see further* final index under Soaps.

### Effect of Hydrogen Ion Concentration on Tension at the Interface Aqueous Phase—Organic Phase

Inorganic acids and bases at concentrations up to 0.2 normal have only a very slight effect (> *ca.* 1%) upon the interfacial tension at the phase boundary benzene—aqueous solution, and have in general a marked effect at low concentrations only in case they react with the organic phase. Thus with esters the presence of a base in the aqueous phase accelerates the hydrolysis. For example, the interfacial tension, ethyl oleate—water, is lowered very rapidly as the concentration of strong base in the aqueous phase is increased, since the rapidity at which sodium oleate is produced at the surface increases with the concentration of the base. Since the chemical composition of the interfacial region changes in such a case with the time, no equilibrium values can be obtained, but in many cases somewhat definite values are obtained provided the liquids are left in contact only about one-half hour.

For numerical data see the literature cited below: Ethyl oleate (19); ethyl caproate (19); chloropicrin (20); diisoamylamine (19); *sec.*-octyl alcohol (19); dichloroethyl sulfide (14); benzene (13).

For aqueous solutions buffered by borate or phosphate against benzene solutions of organic acids and esters, *v.* (23).

### Interfacial Tensions of Liquid Metals against Non-metallic Liquid Phases

$\gamma_i$ (resp. $\gamma_{Hg}$, $\gamma_l$) = interfacial tension, resp. surface tension of Hg, resp. surface tension of the second liquid.

Mercury against a Pure Liquid

$H_2O$, Water (II) (17)

| $\gamma_i$ | $\gamma_l$ | $t$, °C |
|---|---|---|
| 375 | 72.8 | 20 |

$CS_2$, Carbon disulfide (II) (17)

| | | |
|---|---|---|
| 336 | 31.4 | 20 |

$CH_2Cl_2$, Methylene chloride (II) (15)

| | | |
|---|---|---|
| 342.5 | 26.5 | 20 |

$CH_3I$, Methyl iodide (II) (15)

| | | |
|---|---|---|
| 304 | 35.0 | 20 |

$C_2H_4Br_2$, Ethylene bromide (II) (15)

| | | |
|---|---|---|
| 326 | 38.7 | 20 |

$C_2H_4Cl_2$, 1, 1-Dichloroethane (II) (15)

| | | |
|---|---|---|
| 337 | 25.7 | 20 |

$C_2H_5NO_2$, Nitroethane (II) (17)

| | | |
|---|---|---|
| 378 | 34.9 | 20 |

$C_2H_6O$, Ethyl alcohol (II) (15)

| | | |
|---|---|---|
| 364 | 22.4 | 20 |

$C_3H_8O$, *n*-Propyl alcohol (II) (17)

| | | |
|---|---|---|
| 368 | 23.7 | 20 |

$C_4H_{10}O$, Ethyl ether (II) (17)

| | | |
|---|---|---|
| 379 | 21.8 | 20 |

$C_4H_{10}O$, Isobutyl alcohol (II) (17)

| $\gamma_i$ | $\gamma_l$ | $\gamma_{Hg}$ | $t$, °C |
|---|---|---|---|
| 349.1 | 24.3 | 480 | 0 |
| 345.6 | 23.5 | 478 | 10 |

$C_4H_{10}O$.—(*Continued*)

| $\gamma_i$ | $\gamma_l$ | $\gamma_{Hg}$ | $t$, °C |
|---|---|---|---|
| 342.7 | 22.7 | 476 | 20 |
| 341.0 | 22.0 | 474 | 30 |
| 340.2 | 21.3 | 471 | 40 |
| 339.3 | 20.5 | 469 | 50 |

$C_5H_{12}O$, Iso(?)-amyl alcohol (III) (3)

| $\gamma_i$ | $\gamma_l$ | $t$, °C |
|---|---|---|
| 261.6 | | 25 |

$C_6H_5NO_2$, Nitrobenzene (II) (15)

| | | |
|---|---|---|
| 350.5 | 43.4 | 20 |

$C_6H_6$, Benzene (II) (17)

| $\gamma_i$ | $\gamma_l$ | $\gamma_{Hg}$ | $t$, °C |
|---|---|---|---|
| 361.3 | 30.4 | 478 | 10 |
| 357.2 | 28.9 | 476 | 20 |
| 353.7 | 27.6 | 474 | 30 |
| 351.4 | 26.3 | 471 | 40 |
| 349.8 | 24.9 | 469 | 50 |
| 348.8 | 23.6 | 467 | 60 |

$C_6H_7N$, Aniline (II) (17)

| $\gamma_i$ | $\gamma_l$ | $t$, °C |
|---|---|---|
| 341 | 42.6 | 20 |

$C_6H_{14}$, *n*-Hexane (II) (17)

| | | |
|---|---|---|
| 378 | 18.4 | 20 |

$C_7H_8$, Toluene (II) (17)

| | | |
|---|---|---|
| 359 | 29.0 | 20 |

$C_8H_{10}$, *o*-Xylene (II) (17)

| | | |
|---|---|---|
| 359 | 29.0 | 20 |

$C_8H_{10}$, *m*-Xylene (II) (17)

| $\gamma_i$ | $\gamma_t$ | $t$, °C |
|---|---|---|
| 357 | 29.0 | 20 |

$C_8H_{10}$, *p*-Xylene (II) (17)

| | | |
|---|---|---|
| 361 | 27.0 | 20 |

$C_8H_{18}$, *n*-Octane (II) (17)

| $\gamma_i$ | $\gamma_t$ | $\gamma_{Hg}$ | $t$, °C |
|---|---|---|---|
| 377.2 | 23.7 | 480 | 0 |
| 375.8 | 22.7 | 478 | 10 |
| 374.7 | 21.8 | 476 | 20 |
| 373.4 | 20.8 | 474 | 30 |
| 372.6 | 19.8 | 471 | 40 |
| 371.3 | 18.8 | 469 | 50 |
| 371.1 | 17.9 | 467 | 60 |

$C_8H_{18}O$, *sec.*-Octyl alcohol (II) (17)

| | | | |
|---|---|---|---|
| 365.4 | 27.9 | 480 | 0 |
| 361.7 | 27.2 | 478 | 10 |
| 359.0 | 26.3 | 476 | 20 |
| 357.3 | 25.5 | 474 | 30 |
| 355.0 | 24.7 | 471 | 40 |
| 353.6 | 23.8 | 469 | 50 |

$C_{10}H_{23}N$, Diamylamine (II) (17)

| $\gamma$ | $\gamma_t$ | $t$, °C |
|---|---|---|
| 371 | 24.6 | 20 |

$C_{11}H_{20}O_2$, Undecylenic acid (II) (17)

| | | |
|---|---|---|
| 353 | 30.6 | 20 |

$C_{18}H_{34}O_2$, Oleic acid (II) (17)

| | | |
|---|---|---|
| 322 | 32.5 | 20 |

## Mercury against Aqueous Solutions

$d$ = density of aqueous solution, $t°/4°$

$N$ = normality of aqueous soln.

HCl (VI) (27)

| $d$ (or $N$) | $\gamma_i$ | $t$ |
|---|---|---|
| 1.004 | 362.8 | 19–20 |
| 1.032 | 356.1 | |
| 1.122 | 342.4 | |
| 1.190 | 335.7 | |

$H_2SO_4$ (VI, VII) (27, 32)

| | | |
|---|---|---|
| 1.015 | 337.5 | 19.5 |

$H_2SO_4$.—(*Continued*)

| $d$ (or $N$) | $\gamma_i$ | $t$ |
|---|---|---|
| 1.071 | 319.7 | 19.5 |
| 1.0559 | 316 | 20 |

$C_2H_6O$, Ethyl alcohol (IV, VI) (27, 36)

| | | |
|---|---|---|
| 0.969 | 363.2 | 19.5 |
| 0.927 | 361.1 | 19.5 |
| 0.825 | 366.6* | 0 |
| 0.795 | 364.0 | 19.5 |

* Value determined by Method VI.

$C_2H_4O_2$, Acetic acid (VII) (32)

| | | |
|---|---|---|
| 1.006 | 344 | 20.0 |

$Pb(C_2H_3O_2)_2$ (VII) (6)

| | | |
|---|---|---|
| 2*N* | 348 | 20 |
| 2*N** | 338 | 20 |

* $+0.28 \times 10^{-3}N$ $Hg_2(CH_3COO)_2$.

$ZnCl_2$ (VI) (27)

| | | |
|---|---|---|
| 1.094 | 359.0 | 19.5 |
| 1.426 | 328.7 | 19.5 |
| 1.683 | 304.7 | 19.5 |

$ZnSO_4$ (VII) (6)

| | | |
|---|---|---|
| 2*N* | 334 | 20 |
| 2*N** | 258 | 20 |

* $+2.53 \times 10^{-3}N$ $Hg_2SO_4$.

$CdSO_4$ (VII) (6)

| | | |
|---|---|---|
| 2*N* | 324 | 20 |
| 2*N** | 283 | 20 |

* $+1.66 \times 10^{-3}N$ $Hg_2SO_4$.

$CuSO_4$ (VI) (27)

| | | |
|---|---|---|
| 1.012 | 343.2 | 19.5 |
| 1.067 | 334.9 | 19.5 |
| 1.103 | 331.7 | 19.5 |

$Li_2SO_4$ (VII) (6)

| | | |
|---|---|---|
| 1*N* | 365 | 20 |

NaOH (VI) (27)

| | | |
|---|---|---|
| 1.006 | 407.1 | 19.5 |
| 1.079 | 423.0 | 19.5 |
| 1.296 | 429.4 | 19.5 |

$Na_2SO_4$ (VI, VII) (6, 27)

| | | |
|---|---|---|
| 1.010 | 371.8 | 19.5 |
| 1.057 | 371.0 | 19.5 |
| 1.098 | 377.3 | 19.5 |
| 1*N* | 333 | 20 |
| 1*N** | 288 | 20 |

* $+2.8 \times 10^{-3}N$ $Hg_2SO_4$.

$NaC_2H_3O_2$ (VI) (27)

| $d$ (or $N$) | $\gamma_i$ | $t$ |
|---|---|---|
| 1.014 | 379.0 | 19.5 |

$K_2SO_4$ (VII) (6)

| | | |
|---|---|---|
| 1*N* | 354 | 20 |

$K_2C_2O_4$ (VI) (27)

| | | |
|---|---|---|
| 1.029 | 352.3 | 19.5 |
| 1.145 | 353.6 | 19.5 |

$Rb_2SO_4$ (VII) (6)

| | | |
|---|---|---|
| 0.1*N* | 362 | 20 |

## Lead against Fused Salt Mixtures

| Equimolar mixture of KCl + $PbCl_2$ (I) (29) | | KCl + $PbCl_4$ (I), $t$ = 555 − 603° (29) | |
|---|---|---|---|
| $t$ | $\gamma_i$ | Wt. % KCl | $\gamma_i$ |
| 450 | 232 | 0 | 168 |
| 550 | 216 | 10 | 185 |
| 590 | 210 | 20 | 205 |

## Interface, Organic Liquid—Organic Liquid

$CS_2$ against $CH_4O$, Methyl Alcohol

| $\gamma_i$ | $d$,$CS_2$ phase | $d$,$CH_4O$ phase | Method | $t$ | Lit. |
|---|---|---|---|---|---|
| 1.1 | 1.1333 | 0.7466 | II | 18 | (1.5) |

## Effect of Pressure on Interfacial Tension at 25° (I) (30)

Values of $10^3 \frac{1}{\gamma}\frac{\Delta\gamma}{\Delta P}$; unit of $P$ is one dyne/cm²

| Phases | | $10^{-6}P$ = 69 | 138 | 207 | 276 | 345 | 413 |
|---|---|---|---|---|---|---|---|
| Hg | $H_2O$ + 3 % $HNO_3$ | 1.8 | 3.2 | 4.6 | 6.5 | 7.9 | 9.3 |
| | | 1.5 | 3.0 | 4.8 | 5.7 | 6.9 | 8.6 |
| | Ether + 3 % $HNO_3$ | 3.3 | 5.7 | 7.6 | 10.2 | 12.3 | |
| $H_2O$ | Ether | −40.7 | −81.9 | −123.9 | −165.9 | −207.3 | |
| | $CHCl_3$ | − 0.4 | − 2.4 | − 4.8 | − 5.5 | − 7.3 | |
| | $CS_2$ | 2.7 | 9.3 | 15.2 | 23.7 | | |

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(For a key to the periodicals see end of volume)


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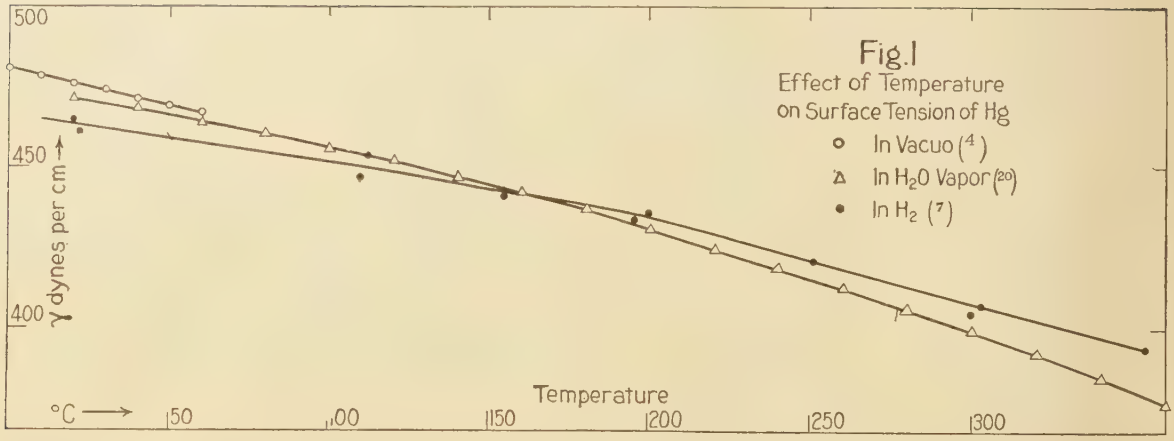
# SURFACE TENSION OF METALS

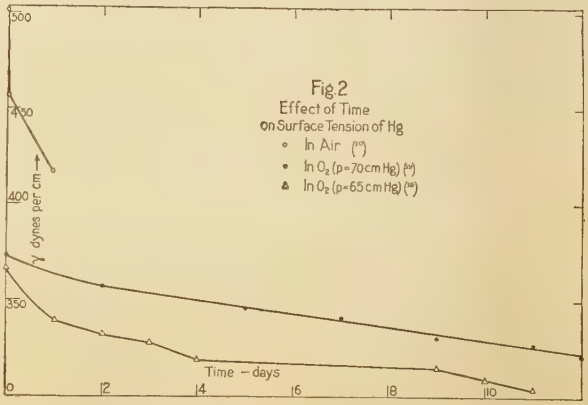

W. Rosenhain, Special Editor

C. Benedicks (CB), L. L. Bircumshaw (LLB) C. H. Desch (CHD), O. F. Hudson (OFH) and T. K. Rose (TKR)


| Metal | Gas | $t$, °C | $\gamma$ | $a^2$ | Method (*v.* p. 433) | Cooperating experts | Lit. |
|---|---|---|---|---|---|---|---|
| Ag† | Air | 970 | 800 | 0.172 | I, II, VII | TKR | (3, 11, 18) |
| Au | Air | 1070 | 580–1000 | | I, II, VII | TKR | (6, 11, 18) |
| Bi | $H_2$ | 320–472 | $\gamma = 378 - 0.063(t - 269)$ | $a^2 = 0.0765 - 0.0533(t - 269)$ | VIII | OFH | (7) |
| Bi | $H_2$ | 583 | 354 | | III | | (17) |
| | $H_2$ | 300 | 388 | | III | LLB | (24) |
| | | 300–962 | $\Delta\gamma/\Delta t = -0.073$ | | III | LLB | |
| | CO | 700–800 | 346 | | I | | (11) |
| Cd | $H_2$ | 421–544 | $\gamma = 630 - 0.065(t - 320)$ | $a^2 = 0.1604 + 0.0555(t - 320)$ | VIII | | (7) |




| Metal | Gas | $t$, °C | $\gamma$ | $a^2$ | Method (*v.* p. 433) | Cooperating experts | Lit. |
|---|---|---|---|---|---|---|---|
| Cu† | Vac. | MP–1400 | | 0.304 ± 2 % | I | | (8) |
| | $H_2$ | 1131 | 1103 | | III | LLB | (17) |
| | | 1131–1215 | $d\gamma/dt = 0.74$ | | III | LLB | |
| Ga | $CO_2$ | 30 | 358 | 0.120 | VI | CHD | (16) |
| Hg* | Vac. | 0 | 470 | 0.0705 | II | TKR | (2, 4) |
| | Vac. | 0 | 480.3 | 0.0721 | II | | (4) |
| | Vac. | 60 | 467.1 | 0.0709 | II | | (4) |
| | Vac. | *v. also* Fig. 1 | | | | | |
| | Air | 15 | 487 | 0.0732 | II, V, VII | | (5, 9, 10, 19) |
| | Air | For effect of time, *v.* Fig. 2 | | | | | |
| | $H_2$ | 20 | 466 | 0.0702 | III, VII | | (7, 19) |
| | $H_2$ | 19 | 470 | | III | LLB | (24) |
| | $H_2$ | For effect of temperature, *v.* Fig. 1 | | | | | |
| | $N_2$ | 15 | 496 | 0.0746 | V, VII | | (9, 19) |
| | $O_2$ | 15 | 487 | 0.0732 | V, VII | | (9, 19) |
| | $O_2$ | For effect of time, *v.* Fig. 2 | | | | | |
| | $H_2O$ | *v.* Fig. 1 | | | | | |
| | $SO_2$ | 15 | 437 (Initial) | | VII | | (9, 16, 19) |
| | | | 365 (10 min) | | | | |
| | | | 337 (24 hr) | | | | |
| | $NH_3$ | 15 | 450 (Initial) | | VII | | (9, 16, 19) |
| | | | 421 (10 min) | | | | |
| | | | 416 (1 hr) | | | | |
| | | | 389 (24 hr) | | | | |
| | $CO_2$ | 15 | 465 | | V, VII | | |
| K | $CO_2$ | 62 | 411 | | II | CHD | (12) |
| Na | $CO_2$ | 90 | 294 | | II | CHD | (12) |
| | Vac. | 100 | 222 | | VII | Ed. | (22) |
| | Vac. | 250 | 211 | | VII | Ed. | (22) |
| Pb† | $H_2$ | 366–522 | $\gamma = 444 - 0.077(t - 327)$ | $a^2 = 0.0846 - 0.0537(t - 327)$ | VIII | OFH | (7) |
| | $H_2$ | 350 | 453 | | III | LLB | (24) |
| | $H_2$ | 350–982 | $\Delta\gamma/\Delta t = -0.062$ | | III | LLB | (24) |
| | $H_2$ | 750 | 423 | | III | LLB | (17) |
| | $H_2$ | 750–1036 | $d\gamma/dt = -0.096$ | | III | LLB | (17) |
| | CO | 770–780 | 425 | | I | | (18) |
| Pt | Air | 2000 | 1819 | | II | TKR | (11) |
| Sb† | $H_2$ | 640 | 350 | | III | LLB | (24) |
| | $H_2$ | 640–970 | $\Delta\gamma/\Delta t = -0.025$ | | III | LLB | (24) |
| | $H_2$ | 750 | 368 | | III | LLB | (17) |
| | $H_2$ | 750–1100 | $d\gamma/dt = -0.063$ | | III | LLB | (17) |
| | CO | 840–850 | 274 | | I | OFH | (18) |
| Sn† | $H_2$ | 319–396 | $\gamma = 531 - 0.080(t - 232)$ | $a^2 = 0.1545 - 0.0571(t - 232)$ | VIII | OFH | (7) |
| | $H_2$ | 253 | 526 | | III | LLB | (24) |
| | $H_2$ | 253–964 | $\Delta\gamma/\Delta t = -0.018$ | | III | LLB | (24) |
| | $H_2$ | 878 | 508 | | III | LLB | (17) |
| | $H_2$ | 878–1050 | $d\gamma/dt = -0.089$ | | III | LLB | (17) |




| Metal | Gas | $t$, °C | $\gamma$ | $a^2$ | Method (*v.* p. 433) | Cooperating experts | Lit. |
|---|---|---|---|---|---|---|---|
| Sn† | CO | 750–910 | 480 | | I | | (18) |
| Zn | $H_2$ | 477 | 753 ± 10 | 0.2354 | VIII | CB | (7) |
| | | 543 | 747 ± 10 | 0.2356 | | | |
| | Air | 590 | 708 ± 40 | 0.224 | I | | (18) |

* For a discussion of the discordant data on Hg, *v.* (21).

† For recent data on Sn, Pb, Sb and Cu, by Method (III), *v.* (25).

‡ Recent values of $a^2$, as given for Ag by (26) (I) in vacuum:

| $t$, °C | $a^2$ | $t$, °C | $a^2$ |
|---|---|---|---|
| 1000 | 0.201 | 1214 | 1.184 |
| 1060 | 0.193 | 1272 | 0.180 |
| 1122 | 0.187 | 1327 | 0.178 |

### Alloys

Pb-Sn (23). Bi-Sn, Bi-Pb, Cu-Sn, Cu-Sb (17, 25). Cast iron (25)

## LITERATURE

(For a key to the periodicals see end of volume)

(1) Batuecas, *132*, **21**: 259; 23. (2) Cenac, *6*, **29**: 298; 13. (3) Gradenwitz, *8* **67**: 467; 99. (4) Harkins and Ewing, *1*, **42**: 2539; 20. (5) Harkins and Grafton, *1*, **43**: 2534; 20. (6) Heydweiller, *8*, **62**: 694; 97. (7) Hogness, *1*, **43**: 1621; 21. (8) Libman, *86*, No. **173**; 28. (9) Meyer, *8*, **66**: 523; 98. (10) Popesco, *34*, **172**: 1474; 21. (11) Quincke, *8*, **134**: 356; 68. (12, 13) Quincke, *8*, **135**: 621; 68. (14) Quincke, *8*, **138**: 141; 70. (15) Quincke, *8*, **52**: 1; 94. (16) Richards and Boyer, *1*, **43**: 274; 21. (17) Sauerwald and Drath, *93*, **154**: 79; 26. **162**: 301; 27. (18) Smith, *47*, **12**: 168; 14. (19) Stöckle, *8*, **66**: 499; 98.
(20) Hagemann, *Diss.*, Freiburg, 1914. (21) Burdon and Oliphant, *83*, **23**: 205; 27. (22) Poindexter, *2*, **27**: 820; 26. (23) Coffman and Parr, *45*, **19**: 1308; 27. (24) Bircumshaw, *3*, **2**: 341; 26. **3**: 1286; 27. (25) Drath and Sauerwald, *93*, **162**: 301; 27. (26) Libman, Univ. of Illinois, *O.*

# SURFACE TENSION AND RELATED PROPERTIES FOR TEMPERATURES BELOW 0°C*

J. E. VERSCHAFFELT

Unless otherwise stated, $g = 980$ and the liquid is in contact with its own vapor. For abbreviations and equations, *v.* p. 433, 434.

**A-TABLE.—ELEMENTARY SUBSTANCES AND ATMOSPHERIC AIR**

**A, Argon** (1) (I). $A_K = 292$; $\alpha = 39$; $n = 1.31$; $k_E = 2.0$

| $T$, °K | $a^2$ | $\gamma \pm 1\%$ | $\gamma_M$ |
|---|---|---|---|
| 85.0 | 0.0190 | 13.2 | 122 |
| 90.0 | 0.0177 | 11.9 | 112 |

**$Cl_2$, Chlorine**†‡ (8) (I). $A_C = 263$; $\alpha = 69$; $k_E = 2.1$; $n = 1.13$

| $t$, °C | $a^2$ | $\gamma \pm 1\%$ | $\gamma_M$ |
|---|---|---|---|
| −30 | 0.0336 | 25.4 | 327 |
| −35 | .0345 | 26.4 | 337 |
| −40 | .0355 | 27.3 | 347 |
| −45 | .0364 | 28.3 | 358 |
| −50 | .0373 | 29.2 | 368 |
| −55 | .0383 | 30.2 | 379 |
| −60 | .0392 | 31.2 | 389 |

**$H_2$, Hydrogen** (9) (I, $g = 981.2$). $\alpha = 5.52$; $A_K = 45.53$; $k_E = 1.36$; $n = 1.11$

| $T$, °K ± 0.02° | $a^2$ | $\gamma \pm 0.1\%$ | $\gamma_M$ |
|---|---|---|---|
| 20.40 | 0.056112 | 1.912 | 17.83 |
| 18.70 | .062338 | 2.197 | 20.14 |
| 17.99 | .065000 | 2.318 | 21.11 |
| 16.16 | .071866 | 2.633 | 23.60 |
| 14.68 | .077000 | 2.882 | 25.53 |

**He, Helium** (13) (I). $A_K = 5.2$; $k_E = 1.0$ (from 4.2 to 2.4°K); $\alpha = 0.63$; $n = 1.13$ (from 4.2 to 3.0°K)

| $T$, °K ± 0.02° | $a^2$ | $\gamma \pm 1\%$ | $\gamma_M$ |
|---|---|---|---|
| 4.20 | 0.001811 | 0.098 | 0.98 |
| 4.00 | .002111 | .120 | 1.19 |
| 3.50 | .002800 | .177 | 1.68 |
| 3.00 | .003500 | .239 | 2.19 |
| 2.50 | .004199 | .296 | 2.69 |
| 2.00 | .004777 | .339 | 3.08 |
| 1.50 | .004966 | .353 | 3.22 |

**$N_2$, Nitrogen**† (1) (I). $A_K = 249$; $\alpha = 27.5$; $k_E = 2.00$; $n = 1.215$

| $T$, °K | $a^2$ | $\gamma \pm 1\%$ | $\gamma_M$ |
|---|---|---|---|
| 70.0 | 0.0255 | 10.53 | 108.7 |
| 75.0 | .0234 | 9.39 | 98.7 |
| 80.0 | .0213 | 8.27 | 88.7 |
| 85.0 | .0192 | 7.20 | 78.7 |
| 90.0 | .0171 | 6.16 | 68.7 |

**Ne, Neon** (14) (I). $A_K = 85.5$; $k_E = 2.0$; $\alpha = 14.7$; $n = 1.20$

| | | | |
|---|---|---|---|
| 24 | 0.0095 | 5.90 | 37.5 |
| 25 | .0091 | 5.50 | 35.5 |
| 26 | .0086 | 5.15 | 33.5 |
| 27 | .0082 | 4.80 | 31.5 |
| 28 | .0077 | 4.45 | 29.5 |

**$O_2$, Oxygen**† (1) (I). $A_K = 295$; $\alpha = 37.7$; $k_E = 1.92$; $n = 1.205$

| | | | |
|---|---|---|---|
| 70.0 | 0.0302 | 18.3 | 160 |
| 75.0 | .0286 | 17.0 | 151 |
| 80.0 | .0269 | 15.7 | 141 |
| 85.0 | .0253 | 14.5 | 132 |
| 90.0 | .0237 | 13.2 | 122 |

**Liquid Air, 65% $O_2$** (in contact with the atmosphere)† (12) (III)

| $t$, °C | $a^2$ | $\gamma \pm 1\%$ |
|---|---|---|
| −190.5 (B. P.) | 0.0243 | 12.2 |

**B-TABLE.—CHEMICAL COMPOUNDS, STANDARD ARRANGEMENT**

**NOCl, Nitrosyl chloride** (2) (I). $A_C = 392$; $\alpha = 68$; $k_E = 1.46$; $n = 0.86$

| $t$, °C ± 0.1° | $a^2$ | $\gamma \pm 1\%$ | $\gamma_M$ |
|---|---|---|---|
| −33.0 | 0.049 | 34.5 | 441 |
| −22.0 | .047 | 33 | 424 |
| − 5.5 | .046 | 30 | 400 |

**CO, Carbon monoxide** (1) (I). $A_K = 265$; $\alpha = 30.0$; $k_E = 2.00$; $n = 1.225$

| $T$, °K | $a^2$ | $\gamma \pm 1\%$ | $\gamma_M$ |
|---|---|---|---|
| 70.0 | 0.0292 | 12.11 | 124.7 |
| 75.0 | .0271 | 10.96 | 114.7 |
| 80.0 | .0249 | 9.83 | 104.7 |
| 85.0 | .0228 | 8.74 | 94.7 |

$CO_2$, *v.* p. 447.

**$C_2H_2$, Acetylene** (11) (I). $A_C = 35$; $\alpha = 82$; $k_E = 2.40$; $n = 1.51$

| $t$, °C | $a^2$ | $\gamma \pm 1\%$ | $\gamma_M$ |
|---|---|---|---|
| −77.4 | 0.0604 | 18.0 | 220 |
| −75.7 | .0599 | 17.7 | 218 |
| −70.5 | .0566 | 16.4 | 204 |
| −69.0 | .0557 | 16.0 | 200 |
| −67.0 | .0548 | 15.6 | 196 |
| −64.0 | .0531 | 15.0 | 190 |
| −62.4 | .0517 | 14.4 | 184 |

**$(CH_3)_2O$, Methyl ether** (10) (I). $A_C = 244$; $\alpha = 63$; $k_E = 2.00$; $n = 1.27$

| | | | |
|---|---|---|---|
| −40.0 | 0.0565 | 21.0 | 324 |
| −30.0 | .0535 | 19.4 | 304 |
| −20.0 | .0505 | 17.9 | 284 |
| −10.0 | .0475 | 16.4 | 264 |

**$(CH_2)_2O$, Ethylene oxide** (10) (I). $A_C = 370$; $\alpha = 74$; $k_E = 1.80$; $n = 1.13$

| | | | |
|---|---|---|---|
| −50.0 | 0.0760 | 35.8 | 460 |
| −40.0 | .0732 | 34.2 | 442 |
| −30.0 | .0704 | 32.5 | 424 |
| −20.0 | .0676 | 30.8 | 406 |
| −10.0 | .0648 | 29.2 | 388 |
| 0.0 | .0620 | 27.6 | 370 |
| +10.0 | .0592 | 25.9 | 352 |
| 20.0 | .0564 | 24.3 | 334 |

**$CH_3NH_2$, Methylamine** (7) (III). $A_C = 267$; $k_E = 1.2$ Nitrogen atmosphere

| | | | |
|---|---|---|---|
| −70 | 0.0785 | 29.2 | 347 |
| −49 | .0749 | 27.0 | 327 |
| −20 | .0681 | 23.6 | 294 |
| −18 | .0672 | 23.1 | 290 |
| −12 | .0649 | 22.2 | 280 |

**$(CH_3)_2NH$, Dimethylamine** (7) (III). $A_C = 296$; $k_E = 1.10$ Nitrogen atmosphere

| | | | |
|---|---|---|---|
| −78 | 0.0680 | 25.2 | 384 |
| −50 | .0625 | 22.4 | 350 |
| −23 | .0584 | 20.2 | 323 |
| 0 | .0543 | 18.1 | 296 |
| + 5 | .0529 | 17.5 | 286 |

* Except metals, for which *see* p. 439; and except organic compounds which are liquid at 0° and 1 atm., for which *see* p. 448. † *See also* p. 442. ‡ *See also* p. 447.

$(CH_3)_3N$, Trimethylamine (7) (III). $A_C = 333$; $k_E = 1.65$

Nitrogen atmosphere

| $t$, °C | $a^2$ | $\gamma \pm 1\%$ | $\gamma_M$ |
|---|---|---|---|
| −73 | 0.0676 | 24.8 | 457 |
| −52 | .0620 | 22.2 | 417 |
| −32 | .0588 | 20.2 | 388 |
| −19 | .0557 | 18.7 | 363 |
| − 4 | .0524 | 17.4 | 339 |

$C_2H_5NH_2$, Ethylamine (7) (III). $A_C = 339$; $k_E = 1.25$

Nitrogen atmosphere

| | | | |
|---|---|---|---|
| −74 | 0.0751 | 28.9 | 430 |
| −33 | .0668 | 24.3 | 376 |
| −21.5 | .0650 | 23.2 | 363 |
| 0 | .0614 | 21.3 | 339 |
| + 9.9 | .0594 | 20.3 | 327 |

## LITERATURE

(For a key to the periodicals see end of volume)

(1) Baly and Donnan, *4*, **81**: 907; 02 (corrected for argon by Rudorf, *8*, **29**: 751; 09 and for CO by Crommelin, *182*, **30**: 248; 14). (2) Briner and Pylkoff, *42*, **10**: 640; 12. (3) Grunmach, *8*, **4**: 367; 01. (4) Grunmach, *8*, **6**: 559; 01. (5) Grunmach, *8*, **15**: 401; 04. (6) Grunmach, *8*, **22**: 107; 07. (7) Jaeger, *93*, **101**: 1; 17. Jaeger and Kahn, *64P*, **18**: 75; 15. (8) Johnson and McIntosh, *1*, **31**: 1139; 09. (9) Kamerlingh Onnes and Kuypers, *168*, No. 142. *64P*, **17**: 528; 14.
(10) Maass and Boomer, *1*, **44**: 1709; 22. (11) Maass and McIntosh, *1*, **36**: 737; 14. (12) Magini, *22*, **19 II**: 184; 10. (13) van Urk, Keesom and Onnes, *168*, No. 179a. *64P*, **28**: 958; 25. (14) van Urk, Keesom and Nijhoff, *168*; No. 182b. *64P*, **29**: 914; 26.

**METHOD IV**

| Substance | $t$, °C | $a^2$ | $\gamma \pm 1\%$ | $\gamma_M$ | $k_E$* | Lit. |
|---|---|---|---|---|---|---|
| $Cl_2$ | − 72 | 0.0410 | 33.0 | 407 | 1.89 | (4) |
| $N_2$ | −196.0 | 0.0219 | 8.7 | 93 | 1.90 | (7) |
| $O_2$ | −182.9 | 0.0235 | 13.2 | 122 | 1.91 | (7) |
| $SO_2$ | − 25 | 0.0442 | 32.6 | 397 | 2.18 | (4) |
| $N_2O$ | − 89.3 | 0.0438 | 26.3 | 286 | 2.28 | (6) |
| $NH_3$ | − 29 | 0.125 | 41.2 | 356 | 2.21 | (4) |
| Air | −190.3 | 0.0235 | Approx. independent of composition† | | | (5) |
| Pictet's liquid | − 33 | 0.047 | 35 | Composition | | (4) |
| | − 60 | 0.049 | 38 | 1 mole $CO_2$ + 1 mole $SO_2$ | | |

* Assuming $\gamma_M$ to vary linearly with $T$ up to $T_c$.

† $\gamma$ at the B. P. for liquid air of any composition may be calculated by substituting values of $d_l$ and $d_v$ in equation (2), p. 434.

# SURFACE TENSIONS OF FUSED SALTS ABOVE 200°C AND LIQUIDS ABOVE 360°C*

ALLAN FERGUSON

B-TABLE.—CHEMICAL COMPOUNDS, STANDARD ARRANGEMENT

For abbreviations and symbols, *v.* p. 433

**S**: In air (4) (I)

| $t$, °C | $d_4^t$ | $\gamma$ | $\gamma_M$ |
|---|---|---|---|
| 445.0 | 1.605 | 38.97 | 456 |

**$BiCl_3$**: In $N_2$ (3) (III)

| | | | |
|---|---|---|---|
| 271 | 3.811 | 66.2 | 1254 |
| 304 | 3.735 | 61.8 | 1187 |
| 331 | 3.682 | 58.1 | 1127 |
| 353 | 3.621 | 55.3 | 1084 |
| 382 | 3.554 | 52.0 | 1032 |

**$BiBr_3$**: In $N_2$ (3) (III)

| | | | |
|---|---|---|---|
| 250 | 4.598 | 66.5 | 1408 |
| 281 | 4.525 | 63.6 | 1361 |
| 299 | 4.471 | 61.6 | 1328 |
| 320 | 4.416 | 59.5 | 1294 |
| 346 | 4.348 | 56.7 | 1246 |
| 370 | 4.286 | 53.8 | 1191 |
| 389 | 4.237 | 52.0 | 1162 |
| 417 | 4.164 | 48.9 | 1106 |
| 442 | 4.099 | 46.2 | 1056 |

**$SnCl_2$**: In $N_2$ (3) (III)

| | | | |
|---|---|---|---|
| 307 | 3.289 | 97.0 | 1449 |
| 328 | 3.263 | 96.2 | 1445 |
| 361 | 3.222 | 93.9 | 1422 |
| 377 | 3.202 | 92.0 | 1402 |
| 405 | 3.166 | 89.0 | 1364 |
| 430 | 3.135 | 86.4 | 1333 |
| 452 | 3.108 | 83.9 | 1302 |
| 480 | 3.072 | 81.6 | 1277 |

**$PbCl_2$**: In air (5) (I)

| $t$, °C | $\gamma$ | $t$, °C | $\gamma$ |
|---|---|---|---|
| 490 | 138 | 541 | 130 |
| 500 | 137 | 552 | 129 |
| 518 | 135 | 571 | 128 |
| 526 | 134 | 590 | 127 |
| 539 | 131 | 614 | 126 |

**$TlNO_3$**: In $N_2$ (3) (III)

| $t$, °C | $d_4^t$ | $\gamma$ | $\gamma_M$ |
|---|---|---|---|
| 210 | 4.899 | 117.3 | 1682 |
| 245 | 4.838 | 115.2 | 1666 |
| 264 | 4.806 | 113.8 | 1653 |
| 285 | 4.768 | 112.0 | 1635 |
| 312 | 4.721 | 109.8 | 1614 |
| 339 | 4.674 | 107.4 | 1589 |
| 364 | 4.630 | 105.2 | 1566 |
| 389 | 4.586 | 102.8 | 1540 |
| 430 | 4.515 | 99.5 | 1507 |

**AgCl**: In air (7) (I)

| $t$, °C | $\gamma$ | $t$, °C | $\gamma$ |
|---|---|---|---|
| 452 | 125.5 | 517 | 119.6 |
| 468 | 124.3 | 532 | 116.3 |
| 472 | 123.6 | 558 | 114.3 |
| 488 | 122.4 | 568 | 113.4 |
| 494 | 121.6 | 573 | 112.8 |

**AgBr**: In air (2)

| $t$, °C | $d_4^t$ | $\gamma$ | $\gamma_M$ |
|---|---|---|---|
| M. P. | | 121.4 | |

**$CaCl_2$**: In air (8) (II)

| | | | |
|---|---|---|---|
| M. P. | | 152 | |

**$BaCl_2$**: In air (8) (II)

| | | | |
|---|---|---|---|
| M. P. | | 171 | |

**LiF**: In $N_2$ (3) (III)

| | | | |
|---|---|---|---|
| 868.5 | 1.789 | 249.5 | 1485 |
| 897.6 | 1.775 | 248.0 | 1484 |
| 944 | 1.753 | 242.3 | 1462 |
| 985 | 1.734 | 238.3 | 1449 |
| 1029 | 1.713 | 233.5 | 1431 |
| 1065 | 1.696 | 229.8 | 1418 |
| 1117 | 1.672 | 222.7 | 1387 |
| 1156 | 1.653 | 217.4 | 1364 |
| 1208 | 1.629 | 210.6 | 1335 |
| 1270 | 1.599 | 201.1 | 1290 |

* Except metals, for which *see* p. 439; organic substances, *see* p. 448; industrial materials, *see* Vol. II; and fused salts melting below 200°C, *see* p. 447.

**LiCl: In $N_2$ [3] (III)**

| $t$, °C | $d_4^t$ | $\gamma$ | $\gamma_M$ |
|---|---|---|---|
| 614 | 1.496 | 137.8 | 1282 |
| 640 | 1.483 | 135.4 | 1267 |
| 680 | 1.466 | 132.9 | 1263 |
| 735 | 1.443 | 128.8 | 1256 |
| 776 | 1.425 | 125.8 | 1237 |
| 814 | 1.409 | 123.2 | 1193 |
| 860 | 1.389 | 119.9 | 1172 |
| 915 | 1.365 | 116.1 | 1148 |
| 968 | 1.342 | 112.6 | 1126 |
| 1022 | 1.319 | 108.5 | 1098 |
| 1075 | 1.296 | 104.8 | 1073 |

**$Li_2SO_4$: In $N_2$ [3] (III)**

| | | | |
|---|---|---|---|
| 860 | 2.004 | 223.8 | 3231 |
| 874 | 1.999 | 223.1 | 3227 |
| 897 | 1.989 | 221.8 | 3219 |
| 923 | 1.978 | 220.2 | 3207 |
| 963 | 1.962 | 217.4 | 3183 |
| 977 | 1.956 | 216.4 | 3175 |
| 1001 | 1.947 | 214.8 | 3161 |
| 1039 | 1.932 | 212.3 | 3141 |
| 1057 | 1.924 | 211.0 | 3130 |
| 1074 | 1.917 | 209.8 | 3120 |
| 1090 | 1.911 | 208.8 | 3111 |
| 1112 | 1.901 | 207.3 | 3100 |
| 1157 | 1.884 | 204.2 | 3072 |
| 1168 | 1.879 | 203.4 | 3066 |
| 1184 | 1.873 | 202.4 | 3057 |
| 1192 | 1.869 | 201.8 | 3052 |
| 1214 | 1.860 | 200.3 | 3039 |

**$LiNO_3$: In $N_2$ [3] (III)**

| | | | |
|---|---|---|---|
| 359 | 1.723 | 111.5 | 1305 |
| 403 | 1.699 | 109.1 | 1288 |
| 418 | 1.690 | 108.4 | 1285 |
| 445 | 1.676 | 106.0 | 1264 |
| 493 | 1.650 | 102.3 | 1232 |
| 555 | 1.616 | 99.0 | 1209 |
| 609 | 1.586 | 96.2 | 1189 |

**$Li_2SiO_3$: In $N_2$ [3] (III)**

| $t$, °C | $\gamma$ | $t$, °C | $\gamma$ |
|---|---|---|---|
| 1254 | 374.6 | 1479 | 352.8 |
| 1380 | 358.2 | 1550 | 348.7 |
| 1421 | 356.2 | 1601 | 346.6 |

**$LiBO_2$: In $N_2$ [3] (III)**

| | | | |
|---|---|---|---|
| 879 | 261.8 | 1198 | 239.7 |
| 922 | 259.7 | 1249 | 234.2 |
| 968 | 256.2 | 1309 | 225.8 |
| 1012 | 253.1 | 1355 | 220.7 |
| 1055 | 250.3 | 1408 | 212.7 |
| 1097 | 247.7 | 1457 | 203.1 |
| 1150 | 243.6 | 1520 | 192.4 |

**NaF: In $N_2$ [3] (III)**

| $t$, °C | $d_4^t$ | $\gamma$ | $\gamma_M$ |
|---|---|---|---|
| 1010 | 1.936 | 199.5 | 1552 |
| 1053 | 1.912 | 195.5 | 1533 |
| 1097 | 1.887 | 191.2 | 1513 |
| 1147 | 1.859 | 185.8 | 1485 |
| 1189 | 1.835 | 180.5 | 1455 |
| 1234 | 1.810 | 176.4 | 1435 |
| 1263 | 1.794 | 173.1 | 1417 |
| 1313 | 1.766 | 167.5 | 1385 |
| 1357 | 1.741 | 162.9 | 1360 |

**NaF.—*(Continued)***

| $t$, °C | $d_4^t$ | $\gamma$ | $\gamma_M$ |
|---|---|---|---|
| 1405 | 1.714 | 157.8 | 1331 |
| 1456 | 1.685 | 152.5 | 1301 |
| 1497 | 1.662 | 148.7 | 1281 |
| 1546 | 1.634 | 143.5 | 1250 |

**NaCl: In $N_2$ [3] (III)**

| | | | |
|---|---|---|---|
| 803 | 1.547 | 113.8 | 1282 |
| 811 | 1.542 | 113.5 | 1281 |
| 821 | 1.536 | 112.9 | 1278 |
| 832 | 1.529 | 111.9 | 1270 |
| 859 | 1.512 | 109.9 | 1257 |
| 883 | 1.497 | 108.2 | 1245 |
| 908 | 1.482 | 106.4 | 1233 |
| 931 | 1.467 | 104.5 | 1219 |
| 961 | 1.449 | 102.7 | 1208 |
| 996 | 1.427 | 99.7 | 1185 |
| 1037 | 1.401 | 97.0 | 1167 |
| 1080 | 1.374 | 94.0 | 1146 |
| 1122 | 1.347 | 91.3 | 1128 |
| 1172 | 1.316 | 88.0 | 1104 |
| M. P. | | 113.3* | |

**NaBr: In $N_2$ [3] (III)**

| | | | |
|---|---|---|---|
| 761 | 2.320 | 105.8 | 1326 |
| 810 | 2.284 | 102.9 | 1303 |
| 852 | 2.250 | 99.6 | 1274 |
| 897 | 2.211 | 96.2 | 1245 |
| 942 | 2.169 | 92.9 | 1218 |
| 985 | 2.125 | 90.0 | 1196 |
| 1029 | 2.078 | 86.2 | 1163 |
| 1074 | 2.026 | 84.0 | 1152 |
| 1116 | 1.974 | 81.1 | 1131 |
| 1166 | 1.912 | 78.0 | 1112 |
| M. P. | | 102.8* | |

**NaI: In $N_2$ [3] (III)**

| | | | |
|---|---|---|---|
| 706 | 2.692 | 85.6 | 1248 |
| 746 | 2.649 | 83.9 | 1237 |
| 816 | 2.575 | 80.5 | 1209 |
| 861 | 2.527 | 77.6 | 1180 |
| M. P. | | 93.9* | |

**$Na_2SO_4$: In $N_2$ [3] (III)**

| | | | |
|---|---|---|---|
| 900 | 2.061 | 194.8 | 3275 |
| 945 | 2.039 | 189.3 | 3205 |
| 990 | 2.017 | 188.2 | 3210 |
| 1032 | 1.997 | 186.5 | 3202 |
| 1077 | 1.971 | 184.7 | 3199 |

**$NaNO_3$: In $N_2$ [3] (III)**

| | | | |
|---|---|---|---|
| 322 | 1.900 | 119.7 | 1509 |
| 355 | 1.877 | 118.1 | 1501 |
| 397 | 1.850 | 115.9 | 1487 |
| 427 | 1.829 | 114.2 | 1476 |
| 466 | 1.803 | 111.8 | 1459 |
| 513 | 1.771 | 108.9 | 1438 |
| 559 | 1.740 | 105.9 | 1415 |
| 602 | 1.711 | 103.4 | 1397 |
| 656 | 1.675 | 99.4 | 1364 |
| 693 | 1.650 | 96.8 | 1340 |
| 738 | 1.620 | 93.7 | 1313 |
| 329 | 1.895 | 110.8 | In air [1] |
| 405 | 1.846 | 106.5 | In air [1] |

* In air [3] (II).

**$NaPO_3$: In $N_2$ (3) (III)**

| $t$, °C | $d_4^t$ | $\gamma$ | $\gamma_M$ |
|---|---|---|---|
| 827 | 2.181 | 197.5 | 2565 |
| 871 | 2.162 | 194.8 | 2544 |
| 927 | 2.137 | 191.6 | 2522 |
| 1014 | 2.099 | 186.7 | 2487 |
| 1099 | 2.062 | 181.6 | 2448 |
| 1181 | 2.025 | 176.6 | 2409 |
| 1265 | 1.989 | 170.9 | 2358 |
| 1317 | 1.966 | 166.7 | 2318 |
| 1434 | 1.914 | 156.2 | 2213 |
| 1517 | 1.878 | 147.5 | 2116 |

**$CH_3CO_2Na$: In air (8) (II)**

| | | | |
|---|---|---|---|
| M. P. | | 38.8 | |

**$Na_2MoO_4$: In $N_2$ (3) (III)**

| | | | |
|---|---|---|---|
| 699 | 2.796 | 214.0 | 3761 |
| 729 | 2.777 | 210.0 | 3707 |
| 751 | 2.763 | 208.1 | 3686 |
| 777 | 2.747 | 204.9 | 3644 |
| 819 | 2.720 | 202.4 | 3623 |
| 859 | 2.695 | 199.0 | 3584 |
| 904 | 2.667 | 195.4 | 3544 |
| 948 | 2.639 | 191.4 | 3496 |
| 990 | 2.613 | 187.7 | 3451 |
| 1035 | 2.584 | 184.1 | 3410 |
| 1079 | 2.557 | 181.2 | 3380 |
| 1122 | 2.530 | 178.8 | 3359 |
| 1172 | 2.499 | 176.1 | 3335 |
| 1212 | 2.473 | 174.6 | 3330 |

**$Na_2WO_4$: In $N_2$ (3) (III)**

| | | | |
|---|---|---|---|
| 710 | 3.893 | 203.3 | 3632 |
| 741 | 3.860 | 201.0 | 3612 |
| 788 | 3.812 | 198.2 | 3591 |
| 834 | 3.765 | 195.2 | 3566 |
| 879 | 3.721 | 191.5 | 3526 |
| 932 | 3.671 | 189.5 | 3521 |
| 985 | 3.623 | 184.2 | 3452 |
| 1039 | 3.576 | 181.4 | 3430 |
| 1081 | 3.541 | 178.3 | 3393 |
| 1133 | 3.499 | 174.6 | 3350 |
| 1181 | 3.461 | 172.4 | 3332 |
| 1232 | 3.424 | 168.0 | 3270 |
| 1282 | 3.390 | 163.8 | 3209 |
| 1332 | 3.355 | 160.6 | 3168 |
| 1391 | 3.318 | 155.0 | 3080 |
| 1450 | 3.282 | 152.0 | 3043 |
| 1517 | 3.245 | 147.3 | 2971 |
| 1559 | 3.224 | 144.0 | 2917 |
| 1595 | 3.208 | 142.6 | 2899 |

**$NaBO_2$: In $N_2$ (3) (III)**

| $t$, °C | $\gamma$ | $t$, °C | $\gamma$ |
|---|---|---|---|
| 1016 | 193.7 | 1234 | 159.7 |
| 1052 | 188.3 | 1277 | 150.8 |
| 1097 | 180.9 | 1323 | 142.9 |
| 1140 | 174.7 | 1372 | 135.1 |
| 1192 | 166.1 | 1441 | 126.2 |

**KF: In $N_2$ (3) (III)**

| $t$, °C | $d_4^t$ | $\gamma$ | $\gamma_M$ |
|---|---|---|---|
| 913 | 1.869 | 138.4 | 1368 |
| 962 | 1.837 | 135.2 | 1352 |
| 1015 | 1.801 | 131.0 | 1328 |
| 1062 | 1.770 | 127.4 | 1306 |
| 1097 | 1.749 | 124.5 | 1287 |

**KF.—(*Continued*)**

| $t$, °C | $d_4^t$ | $\gamma$ | $\gamma_M$ |
|---|---|---|---|
| 1147 | 1.713 | 119.9 | 1256 |
| 1185 | 1.689 | 116.1 | 1228 |
| 1234 | 1.654 | 112.3 | 1205 |
| 1275 | 1.627 | 108.6 | 1178 |
| 1310 | 1.604 | 104.9 | 1148 |

**KCl: In $N_2$ (3) (III)**

| | | | |
|---|---|---|---|
| 800 | 1.509 | 95.8 | 1290 |
| 827 | 1.492 | 94.0 | 1275 |
| 862 | 1.470 | 91.3 | 1251 |
| 885 | 1.456 | 89.7 | 1237 |
| 909 | 1.442 | 88.0 | 1221 |
| 941 | 1.421 | 85.8 | 1203 |
| 986 | 1.396 | 82.2 | 1166 |
| 1029 | 1.370 | 79.1 | 1136 |
| 1054 | 1.355 | 77.2 | 1117 |
| 1088 | 1.335 | 75.2 | 1099 |
| 1104 | 1.326 | 73.7 | 1082 |
| 1125 | 1.313 | 72.5 | 1070 |
| 1167 | 1.287 | 69.6 | 1042 |
| M. P. | | 98.4* | |

**KBr: In $N_2$ (3) (III)**

| | | | |
|---|---|---|---|
| 775 | 2.086 | 85.7 | 1270 |
| 798 | 2.068 | 83.8 | 1249 |
| 826 | 2.045 | 82.0 | 1231 |
| 859 | 2.019 | 79.5 | 1204 |
| 887 | 1.997 | 77.8 | 1187 |
| 920 | 1.970 | 75.4 | 1161 |
| M. P. | | 91.0* | |

**KI: In $N_2$ (3) (III)**

| | | | |
|---|---|---|---|
| 737 | 2.392 | 75.2 | 1270 |
| 764 | 2.364 | 72.1 | 1227 |
| 812 | 2.314 | 69.2 | 1195 |
| 866 | 2.257 | 66.8 | 1173 |
| 873 | 2.250 | 66.5 | 1170 |
| M. P. | | 83.5* | |

**$K_2SO_4$: In $N_2$ (3) (III)**

| | | | |
|---|---|---|---|
| 1070 | 1.888 | 143.7 | 2935 |
| 1103 | 1.870 | 142.6 | 2931 |
| 1145 | 1.848 | 140.6 | 2913 |
| 1199 | 1.818 | 136.7 | 2863 |
| 1247 | 1.792 | 132.7 | 2806 |
| 1306 | 1.760 | 128.8 | 2757 |
| 1347 | 1.737 | 126.2 | 2725 |
| 1372 | 1.724 | 124.6 | 2704 |
| 1400 | 1.709 | 122.4 | 2672 |
| 1440 | 1.687 | 119.8 | 2637 |
| 1463 | 1.674 | 118.1 | 2613 |
| 1490 | 1.660 | 116.1 | 2584 |
| 1530 | 1.637 | 114.1 | 2563 |
| 1586 | 1.607 | 110.7 | 2517 |
| 1656 | 1.569 | 106.8 | 2468 |

**$KNO_3$: In $N_2$ (3) (III)**

| | | | |
|---|---|---|---|
| 380 | 1.837 | 110.4 | 1597 |
| 436 | 1.794 | 106.0 | 1558 |
| 480 | 1.760 | 102.8 | 1531 |
| 534 | 1.719 | 98.5 | 1489 |
| 578 | 1.685 | 95.2 | 1459 |
| 628 | 1.647 | 91.6 | 1426 |
| 675 | 1.611 | 87.9 | 1389 |
| 722 | 1.575 | 84.0 | 1349 |
| 772 | 1.537 | 80.2 | 1307 |
| 349 | 1.869 | 106.4 | } In air (1) (I) |
| 414 | 1.764 | 100.7 | |

*In air (8) (II).

**$KPO_3$: In $N_2$ [3] (III)**

| $t$, °C | $d_4^t$ | $\gamma$ | $\gamma_M$ |
|---|---|---|---|
| 897 | 2.069 | 155.5 | 2304 |
| 942 | 2.049 | 151.8 | 2264 |
| 996 | 2.027 | 149.0 | 2238 |
| 1036 | 2.010 | 146.1 | 2207 |
| 1082 | 1.983 | 143.0 | 2180 |
| 1120 | 1.973 | 140.3 | 2146 |
| 1167 | 1.953 | 136.8 | 2106 |
| 1205 | 1.938 | 133.5 | 2066 |
| 1250 | 1.918 | 130.2 | 2029 |
| 1288 | 1.901 | 126.3 | 1980 |
| 1345 | 1.877 | 122.5 | 1937 |
| 1372 | 1.865 | 118.5 | 1882 |
| 1413 | 1.848 | 114.7 | 1832 |
| 1497 | 1.812 | 105.5 | 1708 |
| 1536 | 1.795 | 100.3 | 1634 |

**KCN: In air [8] (II)**

| M. P. | | 96.1 | |
|---|---|---|---|

**$PbCl_2$.KCl: In air [6] (I)**

| $t$, °C | $\gamma$ | $t$, °C | $\gamma$ |
|---|---|---|---|
| 471 | 105 | 555 | 97.9 |
| 502 | 103 | 582 | 95.1 |
| 522 | 102 | 592 | 94.7 |
| 529 | 101 | 602 | 94.4 |
| 538 | 100 | 616 | 94.4 |
| 547 | 99.2 | | |

**$PbCl_2$.KCl: In liquid Pb [6] (I)**

| 453 | 230 | 531 | 216 |
|---|---|---|---|
| 467 | 228 | 542 | 214 |
| 494 | 223 | 546 | 212 |
| 509 | 219 | 599 | 199 |
| 526 | 220 | | |

**$K_2Cr_2O_7$: In $N_2$ [3] (III)**

| $t$, °C | $d_4^t$ | $\gamma$ | $\gamma_M$ |
|---|---|---|---|
| 420 | 2.271 | 140.1 | |
| 454 | 2 248 | 139.4 | 3593 |
| 480 | 2.229 | 138.4 | 3588 |
| 504 | 2.213 | 137.0 | 3568 |
| 535 | 2.191 | 135.0 | 3540 |

**$K_2MoO_4$: In $N_2$ [3] (III)**

| 931 | 2.362 | 150.5 | 3261 |
|---|---|---|---|
| 977 | 2.334 | 147.3 | 3217 |
| 1021 | 2.307 | 145.2 | 3196 |
| 1105 | 2.255 | 140.7 | 3144 |
| 1143 | 2.230 | 138.6 | 3120 |
| 1189 | 2.200 | 135.5 | 3078 |
| 1273 | 2.144 | 130.0 | 3004 |
| 1356 | 2.087 | 123.6 | 2908 |
| 1438 | 2.029 | 118.0 | 2829 |
| 1453 | 2.018 | 116.9 | 2813 |
| 1522 | 1.959 | 112.5 | 2761 |

**$K_2WO_4$: In $N_2$ [3] (III)**

| 925 | 3.175 | 161.0 | 3531 |
|---|---|---|---|
| 969 | 3.139 | 154.1 | 3406 |
| 1013 | 3.103 | 150.2 | 3346 |
| 1052 | 3.071 | 145.9 | 3275 |
| 1097 | 3.035 | 141.9 | 3207 |
| 1139 | 3.002 | 138.0 | 3143 |
| 1183 | 2.968 | 134.1 | 3076 |
| 1230 | 2.933 | 130.3 | 3013 |
| 1284 | 2.893 | 124.6 | 2908 |

**$K_2WO_4$.—(*Continued*)**

| $t$, °C | $d_4^t$ | $\gamma$ | $\gamma_M$ |
|---|---|---|---|
| 1322 | 2.866 | 120.9 | 2839 |
| 1367 | 2.834 | 118.4 | 2802 |
| 1409 | 2.805 | 114.3 | 2723 |
| 1458 | 2.771 | 110.0 | 2642 |
| 1489 | 2.751 | 107.9 | 2605 |
| 1520 | 2.730 | 105.6 | 2560 |

**$KBO_2$: In $N_2$ [3] (III)**

| 992 | | 123.5 | |
|---|---|---|---|
| 1036 | | 112.3 | |
| 1091 | | 103.0 | |
| 1142 | | 96.6 | |

**RbF: In $N_2$ [3] (III)**

| 803 | 2.894 | 127.2 | 1389 |
|---|---|---|---|
| 847 | 2.851 | 121.3 | 1338 |
| 887 | 2.812 | 116.7 | 1299 |
| 936 | 2.763 | 113.0 | 1273 |
| 986 | 2.711 | 108.9 | 1242 |
| 1037 | 2.657 | 105.2 | 1216 |
| 1085 | 2.605 | 102.2 | 1197 |

**RbCl: In $N_2$ [3] (III)**

| 750 | 2.088 | 95.7 | 1433 |
|---|---|---|---|
| 770 | 2.072 | 94.2 | 1417 |
| 828 | 2.024 | 89.0 | 1360 |
| 880 | 1.981 | 84.5 | 1310 |
| 923 | 1.946 | 81.1 | 1272 |
| 933 | 1.937 | 79.9 | 1257 |
| 962 | 1.914 | 77.3 | 1226 |
| 994 | 1.887 | 74.7 | 1196 |
| 1037 | 1.852 | 71.3 | 1156 |
| 1089 | 1.809 | 66.7 | 1099 |
| 1150 | 1.759 | 61.4 | 1035 |

**RbBr: In $N_2$ [3] (III)**

| 729 | 2.656 | 87.7 | 1378 |
|---|---|---|---|
| 779 | 2.601 | 84.1 | 1340 |
| 831 | 2.542 | 80.7 | 1305 |
| 884 | 2.486 | 77.2 | 1267 |
| 944 | 2.421 | 73.1 | 1222 |
| 986 | 2.375 | 70.2 | 1188 |
| 1041 | 2.318 | 66.7 | 1147 |
| 1121 | 2.226 | 60.6 | 1071 |

**RbI: In $N_2$ [3] (III)**

| 673 | 2.827 | 79.4 | 1414 |
|---|---|---|---|
| 722 | 2.774 | 75.8 | 1367 |
| 772 | 2.719 | 72.2 | 1319 |
| 822 | 2.663 | 68.5 | 1269 |
| 869 | 2.611 | 65.1 | 1222 |
| 918 | 2.557 | 61.6 | 1173 |
| 968 | 2.501 | 58.3 | 1126 |
| 1016 | 2.448 | 55.4 | 1086 |

**$Rb_2SO_4$: In $N_2$ [3] (III)**

| 1086 | 2.538 | 132.5 | 2953 |
|---|---|---|---|
| 1112 | 2.521 | 129.7 | 2903 |
| 1145 | 2.499 | 127.3 | 2866 |
| 1195 | 2.466 | 124.2 | 2821 |
| 1235 | 2.440 | 121.8 | 2786 |
| 1289 | 2.403 | 118.9 | 2748 |
| 1344 | 2.367 | 116.0 | 2708 |
| 1397 | 2.331 | 113.8 | 2684 |
| 1415 | 2.319 | 113.1 | 2676 |
| 1482 | 2.275 | 110.9 | 2658 |
| 1545 | 2.233 | 108.9 | 2643 |

$RbNO_3$: In $N_2$ [3] (III)

| $t$, °C | $d_4^t$ | $\gamma$ | $\gamma_M$ |
|---|---|---|---|
| 327 | 2.467 | 107.5 | 1643 |
| 376 | 2.419 | 104.0 | 1611 |
| 428 | 2.368 | 99.8 | 1568 |
| 480 | 2.318 | 96.1 | 1531 |
| 527 | 2.272 | 92.5 | 1494 |
| 578 | 2.222 | 88.9 | 1457 |
| 625 | 2.177 | 85.6 | 1422 |
| 676 | 2.127 | 81.4 | 1373 |
| 726 | 2.078 | 77.7 | 1332 |

CsF: In $N_2$ [3] (III)

| | | | |
|---|---|---|---|
| 723 | 3.583 | 104.5 | 1270 |
| 769 | 3.526 | 101.0 | 1241 |
| 826 | 3.456 | 96.4 | 1200 |
| 877 | 3.392 | 92.3 | 1164 |
| 930 | 3.327 | 88.1 | 1125 |
| 985 | 3.259 | 84.3 | 1091 |
| 1042 | 3.189 | 81.3 | 1068 |
| 1100 | 3.117 | 78.9 | 1052 |

CsCl: In $N_2$ [3] (III)

| | | | |
|---|---|---|---|
| 664 | 2.772 | 89.2 | 1378 |
| 717 | 2.714 | 85.9 | 1346 |
| 771 | 2.655 | 81.9 | 1302 |
| 830 | 2.592 | 77.7 | 1255 |
| 881 | 2.537 | 73.7 | 1208 |
| 934 | 2.479 | 69.7 | 1160 |
| 979 | 2.421 | 66.4 | 1123 |
| 1035 | 2.370 | 61.6 | 1056 |
| 1080 | 2.332 | 56.3 | 976 |

CsBr: In $N_2$ [3] (III)

| | | | |
|---|---|---|---|
| 658 | 3.116 | 81.8 | 1366 |
| 694 | 3.066 | 78.9 | 1333 |
| 753 | 2.990 | 74.9 | 1286 |
| 808 | 2.915 | 71.6 | 1250 |
| 858 | 2.846 | 68.5 | 1216 |
| 916 | 2.769 | 65.5 | 1184 |
| 971 | 2.695 | 62.7 | 1154 |

CsI: In $N_2$ [3] (III)

| | | | |
|---|---|---|---|
| 654 | 3.158 | 73.1 | 1383 |
| 713 | 3.086 | 68.8 | 1321 |
| 768 | 3.018 | 65.7 | 1281 |
| 821 | 2.953 | 62.5 | 1236 |
| 879 | 2.883 | 59.2 | 1187 |
| 926 | 2.826 | 56.6 | 1153 |
| 980 | 2.760 | 53.8 | 1113 |
| 1030 | 2.699 | 51.1 | 1073 |

$Cs_2SO_4$: In $N_2$ [3] (III)

| | | | |
|---|---|---|---|
| 1036 | 3.037 | 111.3 | 2694 |
| 1063 | 3.018 | 108.2 | 2630 |
| 1105 | 2.988 | 105.0 | 2570 |
| 1165 | 2.937 | 100.8 | 2495 |
| 1221 | 2.889 | 97.3 | 2435 |
| 1275 | 2.841 | 94.7 | 2397 |
| 1331 | 2.787 | 91.7 | 2351 |
| 1372 | 2.743 | 89.8 | 2326 |
| 1423 | 2.690 | 87.4 | 2294 |
| 1470 | 2.636 | 85.5 | 2275 |
| 1530 | 2.566 | 83.0 | 2248 |

$CsNO_3$: In $N_2$ [3] (III)

| | | | |
|---|---|---|---|
| 426 | 2.796 | 91.8 | 1554 |
| 460 | 2.758 | 88.2 | 1507 |
| 511 | 2.700 | 83.7 | 1451 |
| 577 | 2.627 | 79.2 | 1398 |
| 602 | 2.599 | 76.3 | 1356 |
| 686 | 2.505 | 72.5 | 1321 |

### LITERATURE

(For a key to the periodicals see end of volume)

(1) Bottomley, *4*, **83**: 1421; 03. (2) Gradenwitz, *8*, **67**: 467; 99. (3) Jaeger, *93*, **101**: 1; 17. (4) Kellas, *4*, **113**: 903; 18. (5) Lorenz and Kaufler, *25*, **41**: 3727; 08. (6) Lorenz and Liebmann, *7*, **83**: 459; 13. (7) Lorenz, Liebmann and Höchberg, *93*, **94**: 301; 16. (8) Motylewski, *93*, **38**: 414; 04.

# SURFACE-TENSION DATA FOR CERTAIN PURE LIQUIDS BETWEEN 0 AND 360°C AND FOR ALL TYPES OF SOLUTIONS AT ALL TEMPERATURES

T. Fraser Young and William D. Harkins*

### LIQUID—GAS INTERFACE

For abbreviations and symbols, *v.* p. 433

The greater part of the surface-tension values listed in the following tables have been corrected, in so far as possible, to agree with certain "standard" values for water and for benzene ($C_6H_6$) as determined by the capillary-height method. As the primary standard, the value of $\gamma$ for water is taken as equal to 72.75 ± 0.05 dyne/cm at 20° in the presence of air at ordinary pressure. The values used in selecting this standard are those of Richards and Coombs, 1915, corrected 1921 (64) 72.72; Harkins and Brown, 1919 (40) 72.80; Richards and Carver, 1921 (63) 72.73; and Young and Gross (for these tables) 72.80. So far as is known all of these values have been determined with about the same degree of precision, and also with the same order of accuracy with respect to known errors.

The "standard" value for benzene in air at 20° is 28.88 ± 0.03, and is based on the work of Richards and Coombs (64), Richards and Carver (63) and Harkins and Brown (40).

* Assisted by P. L. K. Gross, Ben. H. Nicolet, Leslie Hellerman, B. R. Mortimer, David M. Gans, L. H. Cheng, O. G. Vogel, A. W. Meyer, W. E. Vaughan, B. Ginsberg, E. H. Robinson, and C. M. Marberg.

A-Z Table

**$H_2O$ (I, II, III, IX)** [19, 45, 61, 63, 64, 66, 75, 77, 78, 97, 98, 99, 100, 101)

| $t$, °C | $\gamma$ (air) | $a^2$ (air) |
|---|---|---|
| −8 | 76.96 ± 0.3 | 0.1574 |
| −5 | 76.42 ± 0.2 | .1562 |
| 0 | 75.64 ± 0.1 | .1544$_8$ |
| +5 | 74.92 ± 0.1 | .1529$_9$ |
| 10 | 74.22 ± 0.05 | .1516$_0$ |
| 11 | 74.07 ± 0.05 | .1513$_1$ |
| 12 | 73.93 ± 0.05 | .1510$_3$ |
| 13 | 73.78 ± 0.05 | .1507$_5$ |
| 14 | 73.64 ± 0.05 | .1504$_8$ |
| 15 | 73.49 ± 0.05 | .1501$_9$ |
| 16 | 73.34 ± 0.05 | .1499$_1$ |
| 17 | 73.19 ± 0.05 | .1496$_3$ |
| 18 | 73.05 ± 0.05 | .1493$_7$ |
| 19 | 72.90 ± 0.05 | .1490$_9$ |
| 20 | 72.75 ± 0.05 | .1488$_1$ |
| 21 | 72.59 ± 0.05 | .1485$_2$ |
| 22 | 72.44 ± 0.05 | .1482$_4$ |
| 23 | 72.28 ± 0.05 | .1479$_5$ |
| 24 | 72.13 ± 0.05 | .1476$_8$ |
| 25 | 71.97 ± 0.05 | .1473$_8$ |
| 26 | 71.82 ± 0.05 | .1471$_1$ |
| 27 | 71.66 ± 0.05 | .1468$_3$ |
| 28 | 71.50 ± 0.05 | .1465$_4$ |
| 29 | 71.35 ± 0.05 | .1462$_7$ |
| 30 | 71.18 ± 0.05 | .1459$_7$ |
| 35 | 70.38 ± 0.05 | .1445$_6$ |
| 40 | 69.56 ± 0.05 | .1431$_3$ |
| 45 | 68.74 ± 0.05 | .1417$_3$ |
| 50 | 67.91 ± 0.05 | .1403$_2$ |
| 55 | 67.05 ± 0.05 | .1388$_7$ |
| 60 | 66.18 ± 0.05 | .1374$_1$ |
| 70 | 64.42 ± 0.1 | .1344$_9$ |
| 80 | 62.61 ± 0.1 | .1315 |
| 90 | 60.75 ± 0.2 | .1284 |
| 100 | 58.85 ± 0.2 | .1253 |
| | $\gamma$ (vapor) | |
| 110 | 56.89 ± 0.2 | $k_E$ |
| 120 | 54.89 ± 0.2 | 1.27 |
| 130 | 52.84 ± 0.3 | |
| 25 | | 1.0$_3$ |
| 70 | | 1.0$_7$ |
| 100 | | 1.1$_8$ |

**$H_2O_2$ (I)** [33)

| $t$, °C | $\gamma$ (air) ± *ca.* 0.5 |
|---|---|
| 0.2 | 78.9 |
| 6.2 | 77.9 |
| 11.0 | 77.7 |
| 13.9 | 76.6 |
| 18.2 | 76.1 |

**$Br_2$ (I, II)** $k_E = 2.0$ [22, 40, 57, 73)

| $t$, °C | $\gamma$ (air or vapor) ±0.7 |
|---|---|
| 0 | 45.0 |
| 20 | 41.5 |
| 50 | 36.2 |

**$Cl_2$ (I)** [35); *v. also* p. 441

| $t$, °C | $\gamma$†† |
|---|---|
| 0 | 21.7 |
| 10 | 20.0 |
| 20 | 18.4 |
| 30 | 16.7 |
| 40 | 15.1 |
| 50 | 13.4 |

$\gamma = 72(1 - T/T_C)^{1.1}{}_3$

**$SO_3$ (I)** [68); *cf.* [5)

| $t$, °C | $\gamma$‡‡ |
|---|---|
| 17.5 | 33.1 |
| 35.3 | 30.3 |
| 60.4 | 25.7 |
| 78.3 | 22.3 |
| 100.0 | 17.8 |

**$S_2Cl_2$ (I)** $k_E = 2.2$ [61)

| $t$, °C | $\gamma$ ±1.0 |
|---|---|
| 15.5 | 43.8 |
| 46.3 | 39.3 |
| 78.3 | 35.0 |

**$SCl_2O$ (I, III)** [61, 82)

| $t$, °C | $\gamma$ (air or vapor) ±1.5 |
|---|---|
| 20 | 33.1 |
| 50 | 28.8 |

**$SCl_2O_2$ (III)** [82)

| $t$, °C | $\gamma$ (air)* |
|---|---|
| 13 | 35.26 |
| 23.5 | 32.92 |
| 47.5 | 28.40 |

* The results of [61) are 2 to 5 dyne/cm lower.

**$SOBr_2$ (I)** [36)

| $t$, °C | $\gamma$ (?)†† |
|---|---|
| 17 | 45.0 |
| 25 | 44.4 |

**Se (II)** [57)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 217 | 92.4 ± 2$_0$ |

**$N_2O$ (I)** [84)

| $t$, °C | $\gamma$§ |
|---|---|
| −25 | 10.1$_0$ |
| +10 | 3.3$_7$ |
| 15 | 2.5$_2$ |
| 20 | 1.75 |
| 25 | 1.07 |

$\gamma = 86\left(1 - \frac{T}{T_C}\right)^{1.33}$

**$N_2O_4$ (I)** $k_E = 2.2$ [61)

| $t$, °C | $\gamma$ ±1.0 |
|---|---|
| 1.6 | 30.6 |
| 19.8 | 27.5 |

**$NH_3$ (I)** $k_E = 1.3$ [4)

| $t$, °C | $\gamma$ ± 2.0 |
|---|---|
| 11.1 | 23.4 |
| 34.1 | 18.1 |
| 59.0 | 13.0 |

For notes †–§§ *see* p. 475.

**$P_2O_3$ (I)** $k_E = 2.3$ [71)

| $t$, °C | $\gamma$‡‡ |
|---|---|
| 34.3 | 36.6 |
| 60.25 | 33.2 |
| 78.95 | 31.4 |
| 109.4 | 27.8 |

**$PCl_3$ (I, II)** $k_E = 2.2$ [14, 40, 61, 73)

| $t$, °C | $\gamma$ (air or vapor) ±0.5 |
|---|---|
| 15 | 29.7 |
| 20 | 29.1 |
| 50 | 25.2 |
| 75 | 22.0 |

**$PCl_5$ (I)** $\gamma$ (vapor) [95)

**$POCl_3$ (I, III)** $k_E = 2.2$ [61, 73, 82)

| $t$, °C | $\gamma$ ±0.3 (air) | $\gamma$ ±0.5 (vapor) |
|---|---|---|
| 10 | 33.4 | 33.4 |
| 20 | 32.2 | 32.2 |
| 30 | 30.9 | 30.9 |
| 50 | 28.4 | 28.4 |
| 65 | 26.5 | 26.5 |
| 85 | 24.1 | 24.1 |

**$PBr_3$ (III)** [82)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 24 | 45.8 |
| 33 | 44.1 |
| 59.5 | 38.4 |
| 72 | 37.1 |

**$PI_3$ (III)** [30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 75.3 | 56.5 |
| 121.4 | 53.6 |
| 150 | 51.4 |

**$PSCl_3$ (I)** [73)

$a^2 = 4.4496 - 0.01199t$; at 125°C, $\gamma$ = 21.1

| $t$, °C | $a^2$ ±2% |
|---|---|
| 9.0 | 0.04341 |
| 61.7 | .03710 |
| 65.8 | .03660 |
| 72.0 | .03586 |

**$AsCl_3$ (III)** [30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −21 | 43.8 |
| +50.2 | 36.6 |
| 110 | 31.0 |

**$AsBr_3$ (III)** [30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 49.6 | 49.6 |
| 121 | 41.0 |
| 179.7 | 36.1 |

**$SbCl_3$ (III)** [95)

| $t$, °C | $\gamma$ (air) +1.0§§ |
|---|---|
| 109.5 | 44.51 |
| 127.5 | 41.84 |
| 148.5 | 39.43 |
| 166.5 | 37.38 |

**$SbCl_5$ (III)** $\gamma$ (air) [95)

**$CO_2$ (I)** [84, 85)

| $t$, °C | $\gamma$§ |
|---|---|
| −25 | 9.1$_3$ |
| 0 | 4.4$_9$ |
| +10 | 2.7$_3$ |
| 15 | 1.90 |
| 20 | 1.16 |
| 25 | 0.52 |
| 30 | 0.06 |

$\gamma = 75\left(1 - \frac{T}{T_C}\right)^{1.25}$

**$CCl_4$ (I, II)** [18, 19, 21, 23, 51, 58, 60, 63, 89)

| $t$, °C | $\gamma$ (air) | $\gamma$ (vapor) |
|---|---|---|
| 10 | 28.00 ± 0.1 | 28.22 ± 0.2 |
| 20 | 26.77 ± 0.1 | 26.95 ± 0.1 |
| 30 | 25.53 ± 0.1 | 25.70 ± 0.2 |
| 50 | 23.14 ± 0.2 | 23.22 ± 0.2 |
| 75 | 20.19 ± 0.2 | 20.20 ± 0.2 |
| 100 | | 17.26 ± 0.2 |
| 150 | | 11.66 ± 0.2 |
| 200 | | 6.53 ± 0.2 |
| 250 | | 2.11 ± 0.2 |
| 270 | | 0.68 ± 0.2 |

$\gamma$ (vapor) $= 67.671\left(1 - \frac{T}{556.25}\right)^{1.23} \pm 0.2$, 10 to 270°C, $k_E = 2.21$ from 10 to 100°C; = 2.2 from 10 to 220°C. At 20°C, $a^2$ (air) = 0.0342$_6$. $\gamma$ (vapor) − $\gamma$ (air) = 0.18.

**$CCl_2O$ (I)** $k_E = 2.1$ [54)

| $t$, °C | $\gamma$†† |
|---|---|
| 16.7 | 20.1 |
| 34.5 | 17.6 |
| 46.1 | 15.9 |

**$CS_2$ (I, II, III, IX)** $k_E = 2.1$ [40, 51, 58, 59, 73, 75, 91, 94)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 0 | 35.28 |
| 10 | 33.81 |
| 20 | 32.33 |
| 45 | 28.66 |
| 60 | 26.45 |

**$CCl_3NO_2$, Chloropicrin (I, II)** [26, 73)

| $t$, °C | $\gamma$ (air or vapor) ±0.6 |
|---|---|
| 10 | 33.7 |
| 20 | 32.3 |
| 95 | 22.4 |

For other C-compounds, *v.* p. 448.

**$SiCl_4$, Silicon tetrachloride (I)** $k_E = 2.1$ [61)

| $t$, °C | $\gamma$ ±1.0 |
|---|---|
| 18.9 | 16.9 |
| 45.5 | 14.1 |

**$C_4O_4Ni$, Nickel tetracarbonyl (I)** $k_E = 2.4$ [61)

| $t$, °C | $\gamma$ ±1.0 |
|---|---|
| 19.8 | 14.7 |
| 45.9 | 11.8 |

## ℭ-Table, the ℭ-Arrangement

For abbreviations and symbols, *v.* p. 433

**$CHBrCl_2$, Dichlorobromomethane (I)** $k_E = 2.1$ (90)

| *t*, °C | γ (air) ±0.3 |
|---|---|
| 22.5 | 32.25 |
| 44.0 | 29.36 |
| 61.5 | 27.11 |
| 84.5 | 24.22 |

**$CHBr_3$, Bromoform (I, II)** (14, 25)

| *t*, °C | $a^2$ (air) ±0.001 |
|---|---|
| 55 | 0.0265 |
| 120 | 0.0211 |
| *t*, °C | γ (air) ±0.3 |
| 20 | 41.53 |

**$CHCl_3$, Chloroform (I, II, III)** $k_E = 2.1$ (23, 51, 58, 59, 63, 72, 91)

| *t*, °C | γ | γ (air) |
|---|---|---|
| 10 | 28.60±0.2 | 28.50±0.2 |
| 20* | 27.24±0.1 | 27.14±0.1 |
| 60 | 21.73±0.2 | 21.73±0.2 |
| 77.5 | 19.40±0.3 | |

* At 20°C, $a^2$ (air) = 0.03722; γ(vapor) − γ(air) = +0.10.

**HCN, Hydrogen cyanide (I, II)** $k_E = 1.1$ (8)

| *t*, °C | γ (air)†† |
|---|---|
| 10 | 19.1 |
| 17 | 18.2 |
| 25 | 17.2 |

**$CH_2BrNO_2$, Bromonitromethane (III)** (30)

| *t*, °C | γ ($N_2$) ±2† |
|---|---|
| −18.5 | 48.3 |
| +80 | 36.4 |
| 135.8 | 28.6 |

**$CH_2Cl_2$, Methylene chloride (II)** (23)

At 20°C, γ (air) = 26.52 ± 0.2

**$CH_2I_2$, Methylene iodide (II)** (25)

At 20°C, γ (air) = 50.76 ± 0.3

**$CH_2O_2$, Formic acid (I, II)** $k_E = 0.9$ (30, 31, 46, 50, 61, 73)

| *t*, °C | γ (air) |
|---|---|
| 10 | 38.7±0.5 |
| 20 | 37.6±0.5 |
| 50 | 34.4±0.5 |
| 100 | 29.0±1.0 |

**$CH_2Cl$, Methyl chloride (I)** (86)

| *t*, °C | γ§ |
|---|---|
| 0 | 19.5 |
| 10 | 17.8 |
| 20 | 16.2 |

$$\gamma = 72\left(1 - \frac{T}{T_C}\right)^{1.22}$$

**$CH_3I$, Methyl iodide (I)** (73)

At 2.5°C, $a^2$ (air) = 0.02960 ± 2%; at 43.5°C, $a^2$ (air) = 0.02532 ± 2%, γ (air) = 25.8

**$CH_3NO$, Formamide (I, II)** $k_E = 0.7$ (50, 83, 87)

| *t*, °C | γ (air) ±0.4 |
|---|---|
| 0 | 59.9 |
| 20 | 58.2 |
| 50 | 55.7 |
| 75 | 53.3 |

**$CH_3NO_2$, Nitromethane (I, II)** (23, 50, 73)

| *t*, °C | γ (air) |
|---|---|
| 0 | 39.8 ±0.2 |
| 20 | 36.82±0.1 |
| 45 | 33.4 ±0.2 |
| 100 | 26.1 ±0.3 |

**$CH_4O$, Methyl alcohol (I, II)** (45, 46, 48, 60, 64)

| *t*, °C | γ (air) |
|---|---|
| 0 | 24.49±0.2 |
| 20 | 22.61±0.1 |
| 30 | 21.75±0.2 |
| 50 | 20.14±0.2 |

| *t*, °C | γ ±0.2 | $k_E$ |
|---|---|---|
| 70 | 18.51 | 0.9 |
| 100 | 15.67 | 1.0 |
| 150 | 10.42 | 1.3 |
| 200 | 4.41 | 1.7 |
| 235 | 0.34 | |

From 70 to 235°C,

$$\gamma = 173.245\left(1 - \frac{T}{513.1}\right)^{1.33} - 243.042\left(1 - \frac{T}{513.1}\right)^{2} + 146.344\left(1 - \frac{T}{513.1}\right)^{3}, \pm 0.2.$$

At 20°C, $d_4^{20} = 0.7918$; $a^2$ (air) = 0.05830.

**$CH_4S$, Methylmercaptan (I)** $k_E = 2.1$ (6)

| *t*, °C | γ ± < 1.5 |
|---|---|
| 9.8 | 26.44 |
| 33.3 | 22.42 |
| 43.5 | 20.73 |

**$CH_5N$, Methylamine (III)** (30)

| *t*, °C | γ ($N_2$) ±2† |
|---|---|
| −70 | 29.2 |
| −20 | 23.0 |
| −12 | 21.7 |

**$C_2Cl_4$, Tetrachloroethylene (I, II)** (25, 73)

| *t*, °C | γ (air) |
|---|---|
| 10 | 32.8 ±0.2 |
| 20 | 31.74±0.1 |
| 120 | 21.6 ±0.4 |

**$C_2HCl_3O$, Chloral (I)** $k_E = 2.2$

| *t*, °C | γ (61) | *t*, °C | γ (73) |
|---|---|---|---|
| 19.4 | 25.34 | 20.0 | 30.01 |
| 45.8 | 22.18 | 96.5 | 20.38 |

For notes †–§§ *see* p. 475.

**$C_2HCl_3O_2$, Trichloroacetic acid (III)** (30)

| *t*, °C | γ ($N_2$) ±2† |
|---|---|
| 80.2 | 27.8 |
| 136.5 | 23.4 |
| 196 | 17.8 |

**$C_2H_2Br_4$, 1, 1, 2, 2-Tetrabromoethane (I, II)** $k_E = 2.5$ (23, 90)

| *t*, °C | γ (air) |
|---|---|
| 20 | 49.67±0.1 |
| 45 | 46.54±0.2 |
| 75 | 42.87±0.2 |
| 100 | 39.78±0.2 |

**$C_2H_2Cl_2O_2$, Dichloroacetic acid (III)** (30)

| *t*, °C | γ ($N_2$) ± 2† |
|---|---|
| 25.7 | 35.4 |
| 80.2 | 30.3 |
| 176.2 | 21.4 |

**$C_2H_2Cl_4$, 1, 1, 2, 2-Tetrachloroethane (I)** $k_E = 2.3$ (90)

| *t*, °C | γ (air) ±0.3 |
|---|---|
| 22.5 | 36.03 |
| 40.6 | 33.69 |
| 60.3 | 31.22 |
| 76.3 | 29.23 |
| 92.2 | 27.36 |

**$C_2H_3ClO$, Acetyl chloride (I)** $k_E = 2.1$ (61)

| *t*, °C | γ ±1.0 |
|---|---|
| 14.8 | 26.7 |
| 46.2 | 21.9 |

**$C_2H_3ClO_2$, Chloroacetic acid (III)** (30)

| *t*, °C | γ ($N_2$) ±2† |
|---|---|
| 80.2 | 33.3 |
| 136.2 | 28.1 |
| 176.3 | 23.5 |

**$C_2H_3Cl_3$, 1, 1, 2-Trichloroethane (I)** (73)

| *t*, °C | $a^2$ (air) ±2% | γ (air) |
|---|---|---|
| 7.1 | 0.04922 | |
| 114 | 0.03459 | 22.0 |

**$C_2H_3N$, Acetonitrile (I, II)** $k_E = 1.5$ (12, 39, 62, 73)

| *t*, °C | γ (air) ± 0.1 | γ (vapor) |
|---|---|---|
| 10 | 30.62 | 30.62±0.3 |
| 20 | 29.30 | 29.30±0.3 |
| 50 | 25.40 | 25.40±0.2 |
| 90 | 20.21 | 20.21±0.2 |

**$C_2H_3NS$, Methyl thiocyanate (I)** (73)

$a^2 = 0.07606 - 0.000186t$

| *t*, °C | $a^2$ ±2% | γ |
|---|---|---|
| 9.2 | 0.07435 | |
| 48.5 | 0.06704 | |
| 60.0 | 0.06490 | |
| 73.5 | 0.06239 | |
| 133.0 | 0.05132 | 23.3 |

**$C_2H_4Br_2$, Ethylene bromide (I, II)** $k_E = 2.2$ (14, 21, 51, 58, 59, 65, 73)

| *t*, °C | γ (air) | γ (vapor) |
|---|---|---|
| 10 | 40.05±0.3 | 40.05±0.5 |
| 20 | 38.75±0.1 | 38.75±0.4 |
| 30 | 37.45±0.1 | 37.45±0.4 |
| 40 | 36.15±0.1 | 36.15±0.4 |
| 50 | 34.87±0.2 | 34.87±0.4 |
| 60 | 33.58±0.2 | 33.58±0.4 |
| 100 | 28.40±0.3 | 28.40±0.4 |
| 130 | 24.73±0.4 | 24.73±0.4 |

**$C_2H_4Cl_2$, 1, 1-Dichloroethane (I, II)** (40, 72)

| *t*, °C | γ (air) ±0.5 |
|---|---|
| 35.0 | 23.4 |
| 57.0 | 20.5 |

**$C_2H_4Cl_2$, Ethylene chloride (I, II, III)** (40, 65, 72, 91, 94)

| *t*, °C | γ (air) ±0.3 |
|---|---|
| 10 | 33.6 |
| 20 | 32.2 |
| 40 | 29.5 |
| 60 | 26.7 |
| 80 | 24.0 |

**$C_2H_4O$, Acetaldehyde (I)** $k_E = 1.8$ (32)

| *t*, °C | γ†† |
|---|---|
| 0.1 | 23.9 |
| 10.0 | 22.4 |
| 20.0 | 21.2 |
| 29.0 | 20.1 |
| 43.0 | 18.0 |
| 50.0 | 17.0 |

**$C_2H_4O_2$, Acetic acid (I, II, III)** (3, 45, 46, 48, 60, 73, 91, 94)

| *t*, °C | γ (air) | γ (vapor) |
|---|---|---|
| 10 | 28.62±0.2 | 28.8±0.5 |
| 20 | 27.63±0.2 | 27.8±0.5 |
| 50 | 24.65±0.2 | 24.8±0.5 |
| 75 | 22.18±0.2 | 22.3±0.5 |
| 100 | 19.7 ±0.3 | 19.8±0.4 |
| 118 | 18.1 ±0.3 | 18.1±0.3 |
| 150 | | 15.0±0.3 |
| 180 | | 12.3±0.3 |
| 220 | | 8.5±0.3 |
| 250 | | 5.7±0.3 |
| *t*, °C | $k_E$ | $k'_E$* |
| 20 | 1.3 | 2.0 |
| 100 | 1.3 | 2.05 |
| 150 | 1.35 | 2.15 |
| 250 | 1.45 | 2.3 |

* $k'_E$ calculated for $C_4H_8O_4$.

**$C_2H_4O_2$, Methyl formate (I, II)** (49, 60, 73)

| *t*, °C | γ (vapor) ±0.2 | γ (air) ±0.2 |
|---|---|---|
| 0 | 28.30 | 28.00 |
| 10 | 26.68 | 26.50 |
| 20 | 25.08 | 25.00 |
| 30 | 23.50 | 23.49 |
| 50 | 20.40 | |
| 100 | 13.04 | |
| 150 | 6.41 | |

**$C_2H_4O_2$,—(*Continued*)**

| $t$, °C | $\gamma$ (vapor) ±0.2 | $\gamma$ (air) ±0.2 |
|---|---|---|
| 200 | 0.99 | |
| 210 | 0.21 | |

$\gamma = 77.83\left(1 - \frac{T}{487.1}\right)^{1.23}$ ±0.2, from 50 to 214°C; $k_E = 2.09$ from 0 to 100°C; =2.1 from 0 to 130°C.

**$C_2H_5Br$, Ethyl bromide (I, II) (23, 65, 73)**

| $t$, °C | $\gamma$ (air or vapor) |
|---|---|
| 10 | 25.48 ± 0.2 |
| 20 | 24.15 ± 0.2 |
| 40 | 21.52 ± 0.2 |

**$C_2H_5Cl_2OP$, Ethoxydichlorophosphine (I) (73)**

$a^2 = 0.04751 - 0.0001357t$; $\gamma$ = 19.8 at 116.5°C

| $t$, °C | $a^2$ ±2% |
|---|---|
| 9.1 | 0.04627 |
| 46.7 | 0.04118 |
| 51.3 | 0.04055 |
| 60.0 | 0.03937 |
| 72.5 | 0.03767 |

**$C_2H_5I$, Ethyl iodide (I, II, III)**

$k_E = 2.2$ (18, 61, 65, 73, 91)

| $t$, °C | $\gamma$ (air) ±1 | $\gamma$ (vapor) ±2 |
|---|---|---|
| 10 | 30.6 | 30.6 |
| 20 | 29.4 | 29.4 |
| 50 | 25.6 | 25.6 |
| 75 | 22.4 | 22.4 |

**$C_2H_5NO$, Acetamide (I)** $k_E$ = 1.2 (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 85 | 39.3 |
| 95 | 38.4 |
| 105 | 37.3 |
| 120 | 35.7 |

**$C_2H_5NO$, Acetaldoxime (I)** $k_E$ = 1.5 (11, 92)

| $t$, °C | $\gamma$ ±0.3 |
|---|---|
| 35 | 30.1 |
| 60 | 27.3 |
| 80 | 25.1 |
| 110 | 21.7 |
| 145 | 17.8 |

**$C_2H_5NO_2$, Nitroethane (I)** $k_E$ = 1.7 (61, 73)

| $t$, °C | $\gamma$ (air or vapor) ±0.5 |
|---|---|
| 10 | 33.4 |
| 20 | 32.2 |
| 50 | 28.5 |
| 100 | 22.5 |
| 110 | 21.2 |

**$C_2H_5NO_3$, Ethyl nitrate (I, II) (50, 73)**

| $t$, °C | $\gamma$ (air or vapor) ±0.7 |
|---|---|
| 0 | 31.2 |
| 20 | 28.7 |
| 85 | 20.5 |

**$C_2H_6N_2O$, Dimethylnitrosoamine (I, II)** $k_E$ = 1.8 (50, 83)

| $t$, °C | $\gamma$ (air or vapor) ±0.5 |
|---|---|
| 20 | 38.9 |
| 40 | 36.4 |
| 75 | 31.8 |

**$C_2H_6O$, Ethyl alcohol (I, II, IX) (45, 46, 48, 59, 60, 62, 64, 75)**

| $t$, °C | $\gamma$ (air) | $\gamma$ (vapor) | $k_E$ |
|---|---|---|---|
| 0 | 24.05 ± 0.2 | | |
| 10 | 23.14 ± 0.1 | 23.61 ± 0.3 | |
| 20 | 22.27 ± 0.1 | 22.75 ± 0.3 | 1 0 |
| 30 | 21.43 ± 0.1 | 21.89 ± 0.3 | |
| 40 | 20.60 ± 0.2 | 21.02 ± 0.3 | |
| 50 | 19.80 ± 0.2 | 20.14 ± 0.3 | |
| 60 | 19.01 ± 0.2 | 19.24 ± 0.3 | |
| 70 | 18.22 ± 0.2 | 18.34 ± 0.3 | |
| 100 | | 15.47 ± 0.2 | 1.3 |
| 150 | | 10.16 ± 0.2 | 1.7 |
| 200 | | 4.26 ± 0.2 | 2.1 |
| 240 | | 0.13 ± 0.2 | |

$\gamma = \left[230.564\left(1 - \frac{T}{516.2}\right)^{1.48} - 304.339\left(1 - \frac{T}{516.2}\right)^{2} + 139.756\left(1 - \frac{T}{516.2}\right)^{3}\right]$ ±0.3, from 10 to 240°C. At 20°C, $d_4^{20} = 0.7892$; $a^2$ (air) = 0.0576s.

**$C_2H_6O_2$, Glycol (I, II) (52, 61)**

| $t$, °C | $\gamma$ (air or vapor) ±1.5 |
|---|---|
| 0 | 49.0 |
| 20 | 47.7 |
| 50 | 45.3 |
| 80 | 42.3 |
| 130 | 36.7 |

**$C_2H_6O_4S$, Dimethyl sulfate (III) (82)**

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 18 | 40.12 |
| 36.5 | 37.76 |
| 55 | 35.46 |
| 74.5 | 33.25 |
| 93 | 31.03 |

**$C_2H_6S$, Methyl sulfide (I)** $k_E$ = 2.1 (6)

| $t$, °C | $\gamma \pm <1.5$ |
|---|---|
| 11.1 | 26.50 |
| 32.9 | 23.33 |
| 57.7 | 19.87 |

**$C_2H_6S$, Ethylmercaptan (I, II)** $k_E$ = 2.1 (20, 39, 61)

| $t$, °C | $\gamma$ (air or vapor) ±0.7 |
|---|---|
| 0 | 25.4 |
| 10 | 24.0 |
| 20 | 22.5 |

**$C_2H_7N$, Dimethylamine (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −78 | 25.2 |
| −23 | 20.2 |
| + 5 | 17.7 |

For notes †–§§ *see* p. 475.

**$C_2H_7N$, Ethylamine (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −74 | 29.1 |
| −21.5 | 23.4 |
| + 9.9 | 20.4 |

**$C_2H_8N_2O_3$, Dimethylammonium nitrate (I)** $k_E$ = 0.6 (88)

| $t$, °C | $\gamma$ (air) ±0.5 |
|---|---|
| 69.6 | 52.05 |
| 97.6 | 50.65 |
| 118.0 | 49.75 |

**$C_2H_8N_2O_3$, Ethylammonium nitrate (I)** $k_E$ = 0.5 (88)

| $t$, °C | $\gamma$ (air) ±0.5 |
|---|---|
| 17.5 | 47.67 |
| 20.0 | 47.62 |
| 45.2 | 46.53 |
| 58.5 | 46.02 |

**$C_3H_2N_2$, Malononitrile (I)**

At 36°C, $a^2 = 0.09_6$; varies with time, temperature and thermal history of the sample, *v.* (89).

**$C_3H_4Br_2O_2$, α, β-Dibromopropionic acid (I) (53)**

| $t$, °C | $\gamma$ (?) ±3 |
|---|---|
| 50 | 87 |
| 90 | 56 |

**$C_3H_4Cl_2O$, α, α-Dichloroacetone (II) (23)**

At 20°C, $\gamma$ (air) = 31.91 ± 0.2

**$C_3H_5Br$, 3-Bromopropylene (I) (73)**

$a^2 = 0.042869 - 0.000148t$, $\gamma$ = 21.35 at 70.0°C

| $t$, °C | $a^2$ ±2% |
|---|---|
| 8.0 | 0.04170 |
| 37.5 | 0.03730 |
| 43.5 | 0.03640 |
| 55.0 | 0.03472 |

**$C_3H_5Br_3$, 1, 2, 3-Tribromopropane (II) (25)**

At 20°C, $\gamma$ (air) = 45.36 ± 0.3

**$C_3H_5ClO$, Chloroacetone (II) (23)**

At 20°C, $\gamma$ (air) = 35.27 ± 0.2

**$C_3H_5ClO$, α-Epichlorohydrin (I, III) (73, 82.7)**

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 10 | 38.5 |
| 20 | 37.0 |
| 50 | 32.9 |
| 85 | 28.2 |

**$C_3H_5ClO_2$, Ethyl chloroformate (I)** $k_E$ = 2.1 (61)

| $t$, °C | $\gamma$ ±1.0 |
|---|---|
| 15.1 | 27.5 |
| 46.5 | 23.5 |

**$C_3H_5I$, 3-Iodopropylene (I) (73)**

$a^2 = 0.03747 - 0.000110t$, $\gamma$ = 21.4 at 102.0°C

| $t$, °C | $a^2$ ±2% |
|---|---|
| 11.1 | 0.03625 |
| 43.5 | 0.03269 |
| 45.8 | 0.03249 |
| 66.5 | 0.03016 |

**$C_3H_5N$, Propionitrile (I, II)** $k_E$ = 1.6 (47, 61, 62, 73)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 ¶ |
|---|---|
| 10 | 28.3 |
| 20 | 27.2 |
| 50 | 23.8 |
| 75 | 21.0 |
| 90 | 19.4 |

**$C_3H_5NO$, Lactonitrile (I)** $k_E$ = 1.3 (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 20 | 36.7 |
| 30 | 35.8 |
| 45 | 34.3 |
| 60 | 32.9 |

**$C_3H_5NS$, Ethyl thiocyanate (I) (61, 73)**

| $t$, °C | $\gamma$ |
|---|---|
| 20 | 36.2 |
| 80 | 28.8 |
| 140 | 21.3 |

**$C_3H_5NS$, Ethyl isothiocyanate**

| $t$, °C | $\gamma$ (air) (II) (39) | $t$, °C | $\gamma$ (vapor) (I) (61) |
|---|---|---|---|
| 30.0 | 31.69 | 18.4 | 36.25 |
| 40.0 | 30.56 | 46.0 | 32.59 |
| 50.0 | 29.49 | $k_E$ = 2.2 | |

**$C_3H_6Br_2$, 1, 2-Dibromopropane (I) (73)**

$a^2 = 0.038869 - 0.0000950t$, $\gamma$ = 21.2 at 141.5°C

| $t$, °C | $a^2$ ±2% |
|---|---|
| 10.0 | 0.03792 |
| 63.5 | 0.03283 |
| 71.7 | 0.03205 |

**$C_3H_6Cl_2$, 1, 2-Dichloropropane (I) (73)**

| $t$, °C | $a^2$ (air) ±2% | $\gamma$ |
|---|---|---|
| 8 | 0.05246 | |
| 98 | 0.03889 | 20.0 |

**$C_3H_6O$, Allyl alcohol (I, II)** $k_E$ = 1.5 (50, 61, 72)

| $t$, °C | $\gamma$ (air or vapor) ±0.5 |
|---|---|
| 0 | 27.6 |
| 20 | 25.8 |
| 50 | 23.2 |
| 95 | 19.2 |

**$C_3H_6O$, Acetone (I, II, III)**
$k_E = 1.9$ (12, 43, 47, 48, 61, 62, 72, 91, 94)

| $t$, °C | $\gamma$ (air or vapor) ±0.2 |
|---|---|
| 0 | 26.21 |
| 20 | 23.70 |
| 40 | 21.16 |
| 60 | 18.61 |
| 80 | 16.2 ± 0.3 |

**$C_3H_6O_2$, Propionic acid (I, II)**
$k_E = 1.5$ (50, 61, 73)

| $t$, °C | $\gamma$ (air) ±0.3 | $\gamma$ (vapor) ±0.6 |
|---|---|---|
| 10 | 27.7 | 27.7 |
| 20 | 26.7 | 26.7 |
| 50 | 23.7 | 23.7 |
| 80 | 20.8 | 20.8 |
| 140 | 15.7 | 15.7 |

**$C_3H_6O_2$, Ethyl formate (I, II)**
$k_E = 2.1$ (43, 49, 58, 72)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 0 | 26.2 |
| 20 | 23.6 |
| 50 | 19.8 |
| 80 | 16.0 |
| 130 | 10.0 |
| 185 | 4.0 |
| 210 | 1.9 |

**$C_3H_6O_2$, Methyl acetate (I, II)**
$k_E = 2.2$ (49, 58, 65, 72)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 0 | 27.4 |
| 20 | 24.6 |
| 50 | 20.6 |
| 80 | 16.6 |
| 130 | 10.3 |
| 180 | 4.5 |
| 215 | 1.2 |

**$C_3H_7Br$, Propyl bromide (I)** (73)
$a^2 = 0.04184 - 0.0001428t$, $\gamma = 19.65$ at 71.0°C

| $t$, °C | $a^2$ ±2% |
|---|---|
| 10.0 | 0.04041 |
| 45.2 | 0.03539 |
| 68.5 | 0.03206 |

**$C_3H_7Br$, Isopropyl bromide (I)** (73)
$a^2 = 0.04002 - 0.000145t$, $\gamma = 19.05$ at 60.5°C

| $t$, °C | $a^2$ ±2% |
|---|---|
| 10.5 | 0.03849 |
| 26.0 | 0.03625 |
| 38.3 | 0.03447 |
| 52.5 | 0.03241 |

**$C_3H_7Cl$, $n$-Propyl chloride (I)** (72)

| $t$, °C | $a^2$ (air) ±1.5% | $\gamma$ (air) |
|---|---|---|
| 5.6 | 0.0533 | |
| 47 | 0.0436 | 18.3 |

**$C_3H_7ClO_2$, Monochlorohydrin (I)** $k_E = 1.5$ (89)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 17.0 | 49.19 |
| 35.0 | 47.43 |
| 57.8 | 45.17 |
| 80.2 | 42.97 |
| 98.5 | 41.19 |

**$C_3H_7I$, $n$-Propyl iodide (I)** (73)
$a^2 = 0.03645 - 0.0001045t$, $\gamma = 20.0$ at 102.5°C

| $t$, °C | $a^2$ ±2% |
|---|---|
| 14.0 | 0.03499 |
| 40.0 | 0.03227 |
| 70.0 | 0.02914 |
| 85.3 | 0.02754 |

**$C_3H_7I$, Isopropyl iodide (I)** (73)
$a^2 = 0.034596 - 0.0001045t$, $\gamma = 19.5$ at 89.0°C

| $t$°, C | $a^2$ ±2% |
|---|---|
| 7.0 | 0.03386 |
| 49.5 | 0.02942 |
| 70.0 | 0.02727 |
| 77.0 | 0.02654 |

**$C_3H_7N$, Allylamine (I)** (73)

| $t$, °C | $a^2$ (air) ±2% | $\gamma$ (air) |
|---|---|---|
| 11.0 | 0.06786 | |
| 56 | 0.05907 | 21.2 |

**$C_3H_7NO$, Acetoxime (I)** $k_E = 1.7$ (11)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 63.26 | 26.15 |
| 76.10 | 24.61 |
| 98.50 | 22.25 |
| 113.40 | 20.79 |
| 117.70 | 20.68 |

**$C_3H_7NO$, $n$-Propionaldoxime (I)**
$k_E = 1.4$ (11)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 23.45 | 29.01 |
| 54.70 | 25.99 |
| 97.84 | 22.05 |

**$C_3H_7NO$, Propionamide (I)**
$k_E = 1.3$ (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 80 | 32.1 |
| 90 | 31.2 |
| 105 | 29.8 |
| 120 | 28.4 |

**$C_3H_7NO_2$, Lactamide (I)** $k_E = 1.1$ (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 80 | 44.6 |
| 90 | 43.8 |
| 105 | 42.6 |
| 120 | 41.3 |

**$C_3H_8O$, $n$-Propyl alcohol (I, II)**
$k_E = 1.3$ (47, 61, 62, 65, 72)

| $t$, °C | $\gamma$ (air)* |
|---|---|
| − 5.0 | 25.9 ±0.2 |
| +20.0 | 23.8 ±0.2 |
| 40.0 | 22.15 ±0.2 |
| 60.0 | 20.5 ±0.2 |

**$C_3H_8O$.**—*(Continued)*

| $t$, °C | $\gamma$ (air)* |
|---|---|
| 80.0 | 18.85 ±0.3 |
| 95.0 | 17.6 ±0.3 |

* $\gamma$ (vapor) = same +0.6 to −0.3.

**$C_3H_8O$, Isopropyl alcohol (I)**
$k_E = 1.1$ (61, 72)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 5 | 22.8 |
| 20 | 21.7 |
| 50 | 19.3 |
| 80 | 17.0 |

**$C_3H_8O$, Methyl ethyl ether (I)**
$k_E = 2.2$ (6)

| $t$, °C | $\gamma$ ± <1.5 |
|---|---|
| 7.9 | 17.54 |
| 33.5 | 14.10 |
| 45.5 | 12.60 |

**$C_3H_8O_2$, Methylal (III)** (91)
At 18.0°C, $\gamma$ (air) = 21.4 ± 0.3

**$C_3H_8O_3$, Glycerol (I)** (10, 15, 30, 90.5)

| $t$, °C | $\gamma$ (air) ±3.0 |
|---|---|
| 20 | 63.4 |
| 90 | 58.6 |
| 150 | 51.9 |

**$C_3H_9N$, $n$-Propylamine (I)**
$k_E = 1.9$ (73, 83)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 10 | 23.5 |
| 20 | 22.4 |
| 30 | 21.2 |
| 45 | 19.4 |

**$C_3H_9N$, Isopropylamine (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −72 | 28.1 |
| 0 | 19.4 |
| +25.2 | 16.8 |

**$C_3H_9N$, Trimethylamine (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −73 | 24.8 |
| −32 | 20.0 |
| − 4 | 17.3 |

**$C_4H_4Cl_2O_2$, Succinyl chloride (III)** $\gamma$ (air) (96)

**$C_4H_4N_2$, Succinonitrile (I)**
$k_E = 0.6$ (87)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 80.1 | 35.45 |
| 99.5 | 33.79 |
| 118.2 | 32.17 |

**$C_4H_4S$, Thiophene (I)** (74)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 0 | 36.2 |
| 20 | 33.1 |
| 40 | 30.1 |
| 60 | 27.1 |
| 80 | 24.3 |

For notes †–§§ *see* p. 475.

**$C_4H_5Cl_3O_2$, Ethyl trichloroacetate (I)** (31, 73)

| $t$, °C | $\gamma$ (air) ±0.4 |
|---|---|
| 10 | 32.3 |
| 20 | 31.2 |
| 50 | 28.1 |
| 70 | 25.9 |
| 165 | 15.9 |

**$C_4H_5NO_2$, Methyl cyanoacetate (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −16 | 43.9 |
| +90 | 31.7 |
| 197 | 20.1 |

**$C_4H_5NS$, Allyl isothiocyanate (I, II)** $k_E = 2.1$ (39, 73)

| $t$, °C | $\gamma$ (air or vapor) |
|---|---|
| 0 | 36.8 ± 0.3 |
| 20 | 34.5 ± 0.3 |
| 60 | 29.8 ± 0.3 |
| 90 | 26.5 ± 0.4 |
| 150 | 20.6 ± 0.4 |

**$C_4H_6Cl_2O_2$, Ethyl dichloroacetate (I)** (73)

| $t$, °C | $a^2$ (air) ±2% | $\gamma$ (air) |
|---|---|---|
| 7.3 | 0.05183 | |
| 158 | 0.03143 | 16.8 |

**$C_4H_6O_3$, Acetic anhydride (I)**
$k_E = 2.2$ (61, 73)

| $t$, °C | $\gamma$ ±0.3 |
|---|---|
| 15 | 33.3 |
| 20 | 32.7 |
| 50 | 29.2 |
| 140 | 18.6 |

**$C_4H_7ClO_2$, Ethyl chloroacetate (I)** (73)

| $t$, °C | $a^2$ (air) ±2% | $\gamma$ (air) |
|---|---|---|
| 7 | 0.05731 | |
| 144.5 | 0.03643 | 17.3 |

**$C_4H_7N$, $n$-Butyronitrile (I, II)**
$k_E = 1.7$ (23, 39, 62, 83)

| $t$, °C | $\gamma$ (air) ±0.4¶ |
|---|---|
| 10 | 28.7 |
| 20 | 27.6 |
| 50 | 24.5 |
| 75 | 21.9 |
| 110 | 18.2 |

**$C_4H_8Cl_2S$, $\beta$, $\beta'$-Dichloroethyl sulfide (II)** (24)
At 20°C, $\gamma$ (air) = 42.82 ± 0.5

**$C_4H_8O$, Methyl ethyl ketone (I, II)** (13, 47)

| $t$, °C | $\gamma$ (air or vapor) ±0.2 |
|---|---|
| 0 | 26.9 |
| 20 | 24.6 |
| 40 | 22.3 |
| 75 | 18.4 |

**$C_4H_8O_2$, *n*-Butyric acid (I, II)** $k_E = 1.6$ (50, 61, 73)

| $t$, °C | $\gamma$ (air) ±0.3* |
|---|---|
| 0 | 28.8 |
| 20 | 26.8 |
| 50 | 24.0 |
| 100 | 19.5 |
| 160 | 14.5 |

*$\gamma$ (vapor) = same +0.3 ±0.5.

**$C_4H_8O_2$, Isobutyric acid (I, II)** $k_E = 1.6$ (50, 61, 73)

| $t$ °C | $\gamma$ (air or vapor) |
|---|---|
| 0 | 27.1±0.3 |
| 20 | 25.2±0.3 |
| 50 | 22.4±0.4 |
| 100 | 17.9±0.5 |
| 150 | 13.8±0.5 |

**$C_4H_8O_2$, Ethyl acetate (I, II, III)** $k_E = 2.3$ (17, 49, 60, 62, 65, 72, 91)

| $t$, °C | $\gamma$ (vapor) | $\gamma$ (air) ±0.3 |
|---|---|---|
| 0 | 26.9 ±0.4 | 26.5 |
| 20 | 24.3 ±0.4 | 23.9 |
| 50 | 20.4 ±0.4 | 20.2 |
| 75 | 17.4 ±0.3 | 17.4 |
| 100 | 14.4 ±0.3 | |
| 150 | 8.7 ±0.3 | |
| 200 | 3.7 ±0.3 | |
| 240 | 0.5 ±0.3 | |
| 245 | 0.15±0.3 | |

**$C_4H_8O_2$, Methyl propionate (I, II)** $k_E = 2.2$ (43, 49, 58, 72)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 10 | 26.1 |
| 20 | 24.9 |
| 40 | 22.45 |
| 80 | 17.6 |
| 130 | 11.8 |
| 180 | 6.4 |
| 237 | 1.2 |

**$C_4H_8O_2$, *n*-Propyl formate (I, II)** $k_E = 2.2$ (49, 58, 65, 72)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 0 | 26.8 |
| 20 | 24.5 |
| 50 | 21.1 |
| 100 | 15.5 |
| 130 | 12.1 |
| 190 | 5.9 |
| 240 | 1.5 |

**$C_4H_9Br$, Isobutyl bromide (I)** (73)

$a^2 = 0.04386 - 0.000141t$, $\gamma = 17.6$ at 91.0°C

| $t$, °C | $a^2$ ±2% |
|---|---|
| 10.1 | 0.04244 |
| 58.0 | 0.03710 |
| 69.5 | 0.03407 |

**$C_4H_9Cl$, Isobutyl chloride (I, II)** (23, 73)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 10 | 23.1 ±0.2 |
| 20 | 21.94±0.1 |
| 70 | 16.2 ±0.2 |

**$C_4H_9Cl$, *tert.*-Butyl chloride (II)** (23)

At 20°C $\gamma$ (air) = 19.59 ± 0.2

**$C_4H_9I$, Isobutyl iodide (I)** (73)

$a^2 = 0.03786 - 0.0001032t$, $\gamma = 17.9$ at 119.5°C

| $t$, °C | $a^2$ ±2% |
|---|---|
| 6.5 | 0.03719 |
| 48.5 | 0.03286 |
| 70.2 | 0.03062 |
| 74.5 | 0.03017 |

**$C_4H_9NO$, Methyl ethyl ketoxime (I)** (17)

| $t$, °C | $\gamma$ ±0.3 |
|---|---|
| 13.8 | 30.38 |
| 150.4 | 16.64 |

**$C_4H_9NO_2$, *n*-Butyl nitrite (III)** (82)

| $t$, °C | $\gamma$ ±1 (air)§§ |
|---|---|
| 13 | 22.25 |
| 28.5 | 20.48 |
| 42.5 | 19.12 |
| 56.5 | 17.58 |

**$C_4H_9NO_2$, Methylurethane (I)** (17)

| $t$, °C | $\gamma$ ±0.3 |
|---|---|
| 55.9 | 38.88 |
| 101.2 | 33.39 |
| 150.9 | 27.69 |

**$C_4H_{10}N_2O$, Diethylnitrosoamine (I)** $k_E = 1.9$ (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 20 | 33.1 |
| 30 | 32 1 |
| 45 | 30.6 |
| 60 | 29.0 |
| 75 | 27.4 |

**$C_4H_{10}O$, *n*-Butyl alcohol (I, II)** (50, 61, 65)

| $t$, °C | $\gamma$ (air or vapor) ±0.4 |
|---|---|
| 0 | 26.2 |
| 20 | 24.6 |
| 50 | 22.1 |
| 100 | 17.8 |
| 130 | 15.1 |

**$C_4H_{10}O$, Isobutyl alcohol (I, II)** (20, 50, 61, 62, 64, 72)

At 20°C, $a^2$ (air) = 0.05821; $d_4^{20} = 0.8019$

| $t$, °C | $\gamma$ (air) | $\gamma$ (vapor) ±0.3 |
|---|---|---|
| 0 | 24.4±0.2 | |
| 20 | 22.8±0.1 | 23.0 |
| 30 | 22.1±0.1 | 22.3 |
| 50 | 20.5±0.2 | 22.7 |

**$C_4H_{10}O$.—*(Continued)***

| $t$, °C | $\gamma$ (air) | $\gamma$ (vapor) ±0.3 |
|---|---|---|
| 75 | 18.5±0.3 | 18.6 |
| 105 | 15.9±0.3 | 15.9 |
| 130 | | 13.7 |

**$C_4H_{10}O$, *d-sec.*-Butyl alcohol (I)** (76)

| $t$, °C | $\gamma$‡‡ | $k_E$ |
|---|---|---|
| 10 | 23.5 | 1.4 |
| 80 | 17.4 | 1.5 |

**$C_4H_{10}O$, *dl-sec.*-Butyl alcohol (I)** (76)

| $t$, °C | $\gamma$‡‡ | $k_E$ |
|---|---|---|
| 10 | 23.5 | 1.4 |
| 80 | 17.4 | 1.5 |

**$C_4H_{10}O$, *tert.*-Butyl alcohol (I)** (2, 65)

| $t$, °C | $\gamma$ (air or vapor) ±0.5 |
|---|---|
| 20 | 20.7 |
| 80 | 14.6 |

**$C_4H_{10}O$, Ethyl ether (I, II)** (20, 34, 51, 60, 63, 72)

| $t$, °C | $\gamma$ ±0.2 |
|---|---|
| 20 | 17.01 |
| 50 | 13.47 |
| 100 | 7.97 |
| 150 | 3.12 |
| 190 | 0.15 |

$\gamma$ (vapor) $= 57.358\left(1 - \frac{T}{466.9}\right)^{1.23}$ ±0.2, from 20 to 193°C. $\gamma$ (air) ±0.2 = 16.96 at 20°C; $k_E = 2.25$ from 0 to 100°C. At 20°C, $d_4^{20} = 0.7133$; $a^2$ (air) = 0.04865; $\gamma$ (vapor) − $\gamma$ (air) = +0.05.

**$C_4H_{10}O_2$, Dimethylacetal (I)** (73)

$a^2 = 0.05676 - 0.000217t$, $\gamma = 17.13$ at 63.3°C

| $t$, °C | $a^2$ ±2% |
|---|---|
| 7.5 | 0.05514 |
| 29.5 | 0.05036 |
| 45.0 | 0.04700 |
| 60.0 | 0.04353 |

**$C_4H_{10}O_3S$, *sym.*-Diethyl sulfite (I, II)** $k_E = 2.2$ (44, 89)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 10 | 30.4 |
| 20 | 29.4 |
| 50 | 26.3 |
| 90 | 22.2 |

**$C_4H_{10}O_3S$, Ethyl ethylsulfonate (I)** $k_E = 2.0$ (89)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 17.6 | 36.31 |
| 49.7 | 32.99 |
| 71.5 | 30.80 |
| 96.5 | 28.30 |

**$C_4H_{10}O_4S$, Diethyl sulfate (III)** (82)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 13 | 34.61 |
| 32.5 | 32.54 |
| 48 | 30.86 |
| 70 | 28.60 |

**$C_4H_{10}S$, Ethyl sulfide (I)** (73)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 10 | 26.5 |
| 50 | 21.9 |
| 90 | 17.3 |

**$C_4H_{11}N$, *n*-Butylamine (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −21 | 26.1 |
| +41 | 19.7 |
| 70.8 | 17.4 |

**$C_4H_{11}N$, Isobutylamine (I)** (73)

| $t$, °C | $a^2$ (air) ±2% | $\gamma$ (air) |
|---|---|---|
| 12.3 | 0.06371 | |
| 68 | 0.05218 | 17.6 |

**$C_4H_{11}N$, *tert.*-Butylamine (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −30 | 22.5 |
| +10 | 18.4 |
| 40.5 | 15.3 |

**$C_4H_{11}N$, Diethylamine (I)** (73)

| $t$, °C | $a^2$ (air) ±2% | $\gamma$ (air) |
|---|---|---|
| 10.2 | 0.06069 | |
| 56 | 0.04986 | 16.4 |

**$C_4H_{12}N_2O_3$, Diethylammonium nitrate (I)** $k_E = 0.8$ (88)

| $t$, °C | $\gamma$ (air) ±0.4 |
|---|---|
| 99.6 | 40.31 |
| 100.0 | 40.30 |
| 109.0 | 39.84 |
| 114.8 | 39.51 |

**$C_5H_4O_2$, Furfural (I, II)** (50, 73)

| $t$, °C | $\gamma$ (air or vapor) ±0.4 |
|---|---|
| 20 | 43.5 |
| 30 | 42.2 |
| 40 | 40.9 |
| 160 | 25.4 |

**$C_5H_5N$, Pyridine (I, II)** $k_E = 2.3$ (40, 49, 51, 61, 62, 73, 94)

| $t$, °C | $\gamma$ (air)* |
|---|---|
| 0 | 40.8±1.0 |
| 20 | 38.0±1.0 |
| 40 | 35.0±0.8 |
| 60 | 32.1±0.7 |
| 80 | 29.3±0.6 |
| 100 | 26.4±0.5 |
| 115 | 24.2±0.5 |

*$\gamma$ (vapor) = same +2.0 to −0.5.

For notes †–§§ *see* p. 475.

$C_5H_6$, Cyclopentadiene (I)
$k_E = 1.5$ (92)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 40.4 | 31.5 |
| 101.1 | 25.2 |
| 139.9 | 21.0 |

$C_5H_7NO_2$, Ethyl cyanoacetate (I) $k_E = 1.9$ (89)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 17.5 | 36.07 |
| 31.3 | 34.53 |
| 61.0 | 31.33 |
| 83.9 | 29.07 |
| 101.3 | 27.32 |

$C_5H_8O_2$, Acetylacetone (I, II) (39, 69, 92)

| $t$, °C | $\gamma$ (air or vapor) |
|---|---|
| 0 | 33.3±0.2 |
| 20 | 31.2±0.2 |
| 50 | 28.0±0.2 |
| 100 | 23.0±0.3 |
| 145 | 18.6±0.3 |

$C_5H_8O_2$, $\beta$, $\beta$-Dimethylacrylic acid (I) $k_E = 1.8$ (16)

| $t$, °C | $\gamma$ (air) ±*ca.* 1.5 |
|---|---|
| 85 | 27.9 |
| 110 | 25.7 |
| 137 | 23.0 |
| 155 | 21.6 |
| 177 | 19.4 |

$C_5H_8O_2$, Allyl acetate (I) (73)

| $t$, °C | $a^2$ (air) ±2% | $\gamma$ (air) |
|---|---|---|
| 4.5 | 0.06118 | |
| 103 | 0.04106 | 16.5 |

$C_5H_8O_3$, Levulinic acid (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 25.5 | 39.7 |
| 81.5 | 35.5 |
| 115 | 32.9 |

$C_5H_8O_4$, Dimethyl malonate(II) (39)

| $t$, °C | $\gamma$ (air) ±0.4 |
|---|---|
| 10 | 38.33 |
| 30 | 35.82 |
| 50 | 33.30 |

$C_5H_9N$, Isovaleronitrile (I, II) (23, 39, 73)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 10 | 27.0 ±0.2 |
| 20 | 26.03±0.1 |
| 50 | 23.3 ±0.2 |
| 130 | 16.0 ±0.5 |

$C_5H_9NS$, *n*-Butyl isothiocyanate (I) $k_E = 2.2$ (7)

| $t$, °C | $\gamma$ ±0.3 |
|---|---|
| 11.2 | 31.78 |
| 55.2 | 27.21 |
| 108.5 | 21.87 |

For notes †–§§ *see* p. 475.

$C_5H_{10}$, Trimethylethylene (I, II) (20, 72)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 7 | 18.9 ±0.3 |
| 20 | 17.26±0.1 |
| 37 | 15.1 ±0.3 |

$C_5H_{10}O$, Isovaleraldehyde (I) (73)
$a^2 = 0.06425 - 0.000195t$; $\gamma$ = 16.3 at 93.0°C

| $t$, °C | $a^2$ ±2% |
|---|---|
| 10.0 | 0.06230 |
| 53.5 | 0.05382 |
| 68.0 | 0.05099 |
| 78.7 | 0.04890 |

$C_5H_{10}O$, Diethyl ketone (II) (47)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 0 | 26.90 |
| 15 | 25.33 |
| 30.1 | 23.73 |
| 45 | 22.20 |

$C_5H_{10}O$, Methyl propyl ketone (I, II) $k_E = 2.0$ (50, 61, 62)

| $t$, °C | $\gamma$ (air) ±0.5 | $\gamma$ (vapor) ±0.8 |
|---|---|---|
| 0 | 27.3 | |
| 20 | 25.2 | 26.1 |
| 50 | 21.9 | 22.6 |
| 90 | 17.7 | |

$C_5H_{10}O_2$, Ethyl propionate (I, II) $k_E = 2.3$ (43, 49, 58, 72)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 5 | 25.9 |
| 20 | 24.2 |
| 50 | 20.9 |
| 100 | 15.5 |
| 130 | 12.4 |
| 180 | 7.3 |
| 238 | 2.2 |

$C_5H_{10}O_2$, Isovaleric acid (I, II) $k_E = 1.7$ (20, 50, 61, 65, 73)

| $t$, °C | $\gamma$ (air) | $\gamma$ (vapor) ±1 |
|---|---|---|
| 15 | 26.16±0.1 | 26.16 |
| 20 | 25.33±0.1 | 25.33 |
| 40 | 23.67±0.1 | 23.67 |
| 80 | 20.4 ±0.3 | 20.4 |
| 175 | 12.6 ±0.5 | 12.6 |

$C_5H_{10}O_2$, Isobutyl formate (I) (72)

| $t$, °C | $a^2$ (air) ±1.5% | $\gamma$ (air) |
|---|---|---|
| 5.2 | 0.05871 | |
| 98.5 | 0.04149 | 15.8 |

$C_5H_{10}O_2$, Methyl *n*-butyrate (I, II) $k_E = 2.3$ (43, 49, 58, 72)

| $t$, °C | $\gamma$ (air or vapor) |
|---|---|
| 10 | 26.15±0.2 |
| 20 | 25.00±0.2 |
| 40 | 22.73±0.2 |
| 60 | 20.43±0.2 |

$C_5H_{10}O_2$.—(*Continued*)

| $t$, °C | $\gamma$ (air or vapor) |
|---|---|
| 100 | 16.1±0.2 |
| 132.5 | 12.5±0.5 |
| 185.0 | 7.3±0.5 |
| 210.0 | 5.0±0.5 |
| 238.0 | 2.7±0.5 |

$C_5H_{10}O_2$, Methyl isobutyrate (I, II) $k_E = 2.3$ (49, 58, 62, 65, 72)

| $t$, °C | $\gamma$ (vapor) ±0.3 | $\gamma$ (air) ±0.2 |
|---|---|---|
| 10 | 24.9 | 24.92 |
| 20 | 23.8 | 23.79 |
| 50 | 20.4 | 20.40 |
| 75 | 17.6 | 17.60 |
| 100 | 14.9 | |
| 125 | 12.2 | |
| 150 | 9.6 | |
| 175 | 7.2 | |
| 200 | 4.8 | |
| 237 | 1.8 | |

$C_5H_{10}O_2$, *n*-Propyl acetate (I, II) $k_E = 2.3$ (43, 49, 58, 72)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 0 | 26.6 |
| 20 | 24.3 |
| 50 | 21.0 |
| 100 | 15.6 |
| 130 | 12.4 |
| 190 | 6.5 |
| 240 | 2.2 |

$C_5H_{10}O_3$, Diethyl carbonate (II, III) (20, 82)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 13 | 27.2 ±0.2 |
| 20 | 26.31±0.1 |
| 40 | 24.0 ±0.2 |
| 65 | 21.1 ±0.2 |

$C_5H_{10}O_3$, *dl*-Ethyl lactate (I, II) $k_E = 2.1$ (29, 43, 44)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 0 | 31.9 |
| 20 | 29.9 |
| 50 | 26.8 |
| 80 | 23.7 |
| 110 | 20.7 |

$C_5H_{10}O_4$, Glyceryl acetate (I) $k_E = 1.7$ (89)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 17.0 | 43.5 |
| 37.5 | 41.6 |
| 70.0 | 38.6 |
| (II) (39) | |
| 10.0 | 41.3 |
| 37.5 | 38.6 |

$C_5H_{11}Br$, Isoamyl bromide (I) (73)
$a^2 = 0.04650 - 0.000134t$,
$\gamma$ = 16.3 at 118.5°C

$C_5H_{11}Br$.—(*Continued*)

| $t$, °C | $a^2$ ±2% |
|---|---|
| 15.1 | 0.0445 |
| 47.0 | 0.0402 |
| 69.5 | 0.0372 |
| 87.5 | 0.0348 |

$C_5H_{11}Cl$, Isoamyl chloride (I, II) (23, 73)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 10 | 24.4 ±0.3 |
| 20 | 23.48±0.1 |
| 100 | 15.7 ±0.3 |

$C_5H_{11}I$, Isoamyl iodide (I) (14, 73)

| $t$, °C | $a^2$ ±2% |
|---|---|
| 5 | 0.0400 |
| 20 | 0.0384 |
| 40 | 0.0363 |
| 70 | 0.0332 |
| 145 | 0.0253 |

$C_5H_{11}N$, Piperidine (I, II) $k_E = 2.1$ (47, 58, 61, 73)

| $t$, °C | $\gamma$ (air) ±0.2* |
|---|---|
| 0 | 32.65 |
| 20 | 30.20 |
| 30 | 28.95 |
| 50 | 26.6 |
| 75 | 23.7 |
| 105 | 20.4 |
| 130 | 17.5 |

*$\gamma$ (vapor) = same +0.2 ±0.3.

$C_5H_{11}NO$, Methyl propyl ketoxime (I) $k_E = 1.9$ (11, 62)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 10 | 30.0 |
| 20 | 29.1 |
| 50 | 26.3 |
| 100 | 21.7 |
| 145 | 17.6 |

$C_5H_{11}NO$, Isovaleraldoxime (I) $k_E = 1.7$ (11, 17)

| $t$, °C | $\gamma$ ±0.3 |
|---|---|
| 20 | 27.8 |
| 50 | 25.0 |
| 100 | 20.6 |
| 150 | 16.4 |

$C_5H_{11}NO_2$, Isoamyl nitrite (III) (82)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 14 | 22.04 |
| 35 | 20.35 |
| 56 | 18.06 |
| 73 | 16.28 |

$C_5H_{11}NO_2$, Ethylurethane (I) $k_E = 1.5$ (17, 83)

| $t$, °C | $\gamma$ ±0.3 |
|---|---|
| 60 | 31.8 |
| 80 | 29.9 |
| 100 | 27.9 |
| 150 | 22.9 |

$C_5H_{11}NO_3$, Isoamyl nitrate (I, II) (23, 73)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 20 | 27.18±0.1 |
| 143 | 20.0 ±0.4 |

**$C_5H_{12}$, Isopentane (II) (23)**
At 20°C, $\gamma$ (air) = 13.72 ±0.2

**$C_5H_{12}O$, Isoamyl alcohol (I, II, III) (42, 46, 62, 65, 72, 91)**

| $t$, °C | $\gamma$ (air) ±0.5 |
|---|---|
| 0 | 25.3 |
| 10 | 24.6 |
| 20 | 23.8 |
| 50 | 21.5 |
| 100 | 17.7 |
| 130 | 15.1 |

**$C_5H_{12}O$, *tert.*-Amyl alcohol (I) (72)**

| $t$, °C | $a^2$ (air) ±1.5% | $\gamma$ (air) |
|---|---|---|
| 3.9 | 0.05949 | |
| 120 | 0.04283 | 15.2 |

**$C_5H_{12}O$, Ethyl propyl ether (II) (50)**

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 0 | 21.69 |
| 20 | 19.46 |

**$C_5H_{13}N$, *n*-Amylamine (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −21 | 25.9 |
| +41.2 | 20.4 |
| 99.8 | 15.6 |

**$C_5H_{13}N$, Isoamylamine (I) $k_E$ = 2.0 (73, 83)**

| $t$, °C | $\gamma$ (air) ±0.4 |
|---|---|
| 10 | 24.6 |
| 20 | 23.6 |
| 50 | 20.75 |
| 75 | 18.35 |
| 95 | 16.4 |

**$C_5H_{13}N$, *tert.*-Amylamine (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −70 | 27.6 |
| +29.3 | 19.7 |
| 70 | 15.5 |

**$C_6H_3BrN_2O_4$, 4-Bromo-1, 2-dinitrobenzene (I) (53)**

| $t$, °C | $\gamma$ (?) ±3 |
|---|---|
| 40 | 13 |
| 80 | 12 |

**$C_6H_3ClN_2O_4$, 1-Chloro-2, 4-dinitrobenzene (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 60.4 | 45.5 |
| 136 | 38.3 |
| 204.2 | 31.5 |

**$C_6H_3ClN_2O_4$, 4-Chloro-1, 2-dinitrobenzene (I) (53)**

| $t$, °C | $\gamma$ (?) ±3 |
|---|---|
| 30 | 14 |
| 70 | 12 |

**$C_6H_3Cl_2NO_2$, 1, 2-Dichloro-4-nitrobenzene (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 46 | 40.2 |
| 136 | 32.0 |
| 204 | 25.6 |

**$C_6H_3Cl_2NO_2$, 1, 3-Dichloro-4-nitrobenzene (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 35 | 41.3 |
| 114.9 | 33.3 |
| 204 | 24.4 |

**$C_6H_3Cl_2NO_2$, 1, 4-Dichloro-2-nitrobenzene (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 60.5 | 38.3 |
| 136 | 31.5 |
| 204 | 25.0 |

**$C_6H_3Cl_3O$, 2, 4, 6-Trichlorophenol (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 70.2 | 36.3 |
| 156 | 28.6 |
| 196.5 | 24.1 |

**$C_6H_4BrCl$, *p*-Chlorobromobenzene (III) (81)**

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 70 | 33.15 |
| 102 | 29.81 |
| 106 | 29.41 |
| 132 | 26.75 |
| 164 | 23.54 |
| 194 | 20.60 |

$$\gamma \text{ (air)} = 71.83\left(1 - \frac{T}{722}\right)^{1.2}$$

**$C_6H_4BrF$, *p*-Fluorobromobenzene (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±*ca.* 2† |
|---|---|
| −21 | 39.8 |
| +70 | 29.4 |
| 138 | 22.4 |

**$C_6H_4BrNO_2$, *o*-Bromonitrobenzene (III) (82.6)**

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 55.5 | 43.44 |
| 67.5 | 42.12 |
| 80 | 40.56 |
| 94.5 | 38.94 |

**$C_6H_4BrNO_2$, *m*-Bromonitrobenzene (III) (82.6)**

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 63 | 42.45 |
| 71.5 | 41.36 |
| 83 | 40.10 |
| 91 | 38.94 |

**$C_6H_4BrNO_2$, *p*-Bromonitrobenzene (III) (82.6)**

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 132 | 34.58 |
| 145 | 33.12 |
| 159.5 | 31.78 |
| 170 | 30.63 |

**$C_6H_4ClI$, *p*-Chloroiodobenzene (III) (81)**

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 61 | 37.57 |
| 88 | 34.78 |
| 113 | 32.22 |
| 127 | 30.80 |

For notes †–§§ *see* p. 475.

**$C_6H_4ClI$.—(*Continued*)**

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 167 | 26.82 |

$$\gamma \text{ (air)} = 74.71\left(1 - \frac{T}{767}\right)^{1.2}$$

**$C_6H_4ClNO_2$, *o*-Chloronitrobenzene (III) (82.6)**

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 50.5 | 42.29 |
| 70.5 | 39.80 |
| 91.5 | 37.23 |
| 121 | 34.04 |

**$C_6H_4ClNO_2$, *m*-Chloronitrobenzene (III) (82.6)**

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 60.5 | 41.79 |
| 74.5 | 38.76 |
| 90.5 | 36.27 |
| 129 | 31.77 |

**$C_6H_4ClNO_2$, *p*-Chloronitrobenzene (III) (81)**

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 97 | 35.73 |
| 111 | 34.23 |
| 127 | 32.52 |
| 141 | 31.05 |
| 156 | 29.48 |
| 179 | 27.19 |
| 186 | 26.38 |

$$\gamma \text{ (air)} = 78.68\left(1 - \frac{T}{768}\right)^{1.2}$$

**$C_6H_4Cl_2$, *m*-Dichlorobenzene (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −22 | 41.6 |
| +90.7 | 28.6 |
| 160 | 22.8 |

**$C_6H_4Cl_2$, *p*-Dichlorobenzene (III) (81)**

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 68 | 30.72 |
| 96 | 27.65 |
| 117 | 25.39 |
| 139 | 23.06 |
| 150 | 21.84 |
| 166 | 20.24 |
| 170 | 19.84 |

$$\gamma \text{ (air)} = 71.45\left(1 - \frac{T}{675}\right)^{1.2}$$

**$C_6H_4FNO_2$, *m*-Fluoronitrobenzene (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 0 | 40.1 |
| 104.5 | 29.7 |
| 196 | 21.4 |

**$C_6H_4FNO_2$, *p*-Fluoronitrobenzene (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 24.5 | 38.4 |
| 89.3 | 31.3 |
| 194.1 | 20.3 |

**$C_6H_4INO_2$, *o*-Iodonitrobenzene (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 61 | 43.1 |
| 136 | 35.8 |
| 205 | 29.5 |

**$C_6H_4INO_2$, *m*-Iodonitrobenzene (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 25.7 | 47.3 |
| 156.1 | 33.7 |
| 216 | 28.6 |

**$C_6H_4N_2O_4$, *o*-Dinitrobenzene (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 126 | 38.4 |
| 176 | 33.6 |
| 209.1 | 30.9 |

**$C_6H_4N_2O_4$, *m*-Dinitrobenzene (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 94.8 | 42.3 |
| 155 | 36.1 |
| 204.5 | 31.8 |

**$C_6H_4N_2O_4$, *p*-Dinitrobenzene (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 176.2 | 34.4 |
| 210 | 31.5 |
| 226 | 30.4 |

**$C_6H_4N_2O_5$, 2, 4-Dinitrophenol (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 125.4 | 41.1 |
| 170 | 37.3 |
| 215 | 32.9 |

**$C_6H_4O_2$, *p*-Benzoquinone (III) $\gamma$ (air) (96)**

**$C_6H_5Br$, Bromobenzene (I, II, III) (25, 40, 73, 81)**

| $t$, °C | $\gamma$ (air) ±0.5 |
|---|---|
| 10 | 37.7 |
| 20 | 36.5 |
| 50 | 33.0 |
| 100 | 27.2 |
| 150 | 21.7 |

**$C_6H_5BrO$, *m*-Bromophenol (I) $k_E$ = 1.8 (28)**

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 44.5 | 42.87 |
| 69.5 | 40.51 |
| 100.1 | 37.40 |

**$C_6H_5BrO$, *p*-Bromophenol (I) $k_E$ = 1.9 (28)**

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 74.4 | 42.36 |
| 99.9 | 39.54 |

**$C_6H_5Cl$, Chlorobenzene (I, II, III) (23, 43, 51, 58, 59, 60, 62, 73, 80, 89)**

| $t$, °C | $\gamma$ (air) | $\gamma$ (vapor) ±0.2 |
|---|---|---|
| 10 | 34.40 ±0.2 | 34.78 |
| 20 | 33.19 ±0.1 | 33.56 |
| 30 | 31.98 ±0.2 | 32.35 |
| 40 | 30.79 ±0.2 | 31.15 |
| 50 | 29.63 ±0.2 | 29.95 |
| 75 | 26.77 ±0.2 | 27.00 |
| 100 | 24.00 ±0.2 | 24.11 |

$C_6H_5Cl$.—(*Continued*)

| t, °C | γ (air) | γ (vapor) ±0.2 |
|---|---|---|
| 130 | 20.71±0.2 | 20.72 |
| 150 | | 18.52 |
| 200 | | 13.24 |
| 250 | | 8.33 |
| 300 | | 3.92 |
| 330 | | 1.64 |

$\gamma\ (\text{vapor}) = 72.20\left(1 - \frac{T}{632.3}\right)^{1.23} \pm 0.2$, from 10 to 333°C. $k_E = 2.21$ from 10 to 100°C; =2.2 from 10 to 250°C.

$C_6H_5ClO$, *o*-Chlorophenol (I) $k_E = 2.2$ (28)

| t, °C | γ ±0.4 |
|---|---|
| 12.7 | 42.25 |
| 45.2 | 38.17 |
| 73.3 | 34.20 |

$C_6H_5ClO$, *m*-Chlorophenol (I) $k_E = 1.9$ (28)

| t, °C | γ ±0.4 |
|---|---|
| 33.0 | 41.72 |
| 78.6 | 37.23 |
| 138.5 | 30.73 |

$C_6H_5ClO$, *p*-Chlorophenol (I) $k_E = 2.0$ (28)

| t, °C | γ ±0.4 |
|---|---|
| 51.6 | 41.09 |
| 72.4 | 39.08 |
| 99.8 | 35.70 |

$C_6H_5F$, Fluorobenzene (II) (40)

| t, °C | γ (air) ±0.3 |
|---|---|
| 9.3 | 28.49 |
| 34.5 | 25.15 |

$C_6H_5I$, Iodobenzene (I, II, III) (18, 25, 40, 73, 81)

| t, °C | γ (air) |
|---|---|
| 15 | 40.3±0.3 |
| 20 | 39.7±0.2 |
| 60 | 35.2±0.3 |
| 100 | 30.6±0.5 |
| 150 | 25.0±0.7 |
| 189 | 10.8±1.0 |

$C_6H_5NO_2$, Nitrobenzene (I, II, III, IX) $k_E = 2.2$ (17, 23, 47, 61, 73, 75, 81)

| t, °C | γ (air or vapor) ±0.5 |
|---|---|
| 0 | 46.4 |
| 20 | 43.9 |
| 50 | 40.2 |
| 75 | 37.3 |
| 100 | 34.4 |
| 150 | 29.0 |
| 195 | 24.1 |

$C_6H_5NO_3$, *o*-Nitrophenol (I) $k_E = 2.5$ (28)

| t, °C | γ ±0.4 |
|---|---|
| 53.2 | 37.73 |
| 79.7 | 34.50 |

$C_6H_5NO_3$, *m*-Nitrophenol (I) $k_E = 1.7$ (28)

| t, °C | γ* |
|---|---|
| 116.0 | 48.01 |
| 147.0 | 44.92 |

*The results of (30) are about 8 dyne/cm smaller.

$C_6H_5NO_3$, *p*-Nitrophenol (I) $k_E = 1.9$ (28)

| t, °C | γ* |
|---|---|
| 129.7 | 45.66 |
| 162.5 | 42.17 |

*The results of (30) are about 4.5 dyne/cm smaller.

$C_6H_5NO_4$, 2-Nitroresorcinol (III) (30)

| t, °C | γ ($N_2$) ±2† |
|---|---|
| 90.7 | 39.5 |
| 140 | 34.0 |
| 185.5 | 29.1 |

$C_6H_6$, Benzene (I, II, III, IX) (19, 21, 58, 59, 60, 61, 62, 63, 64, 66, 75, 77, 78, 80, 87, 89, 94); *v. also* p. 446

| t, °C | γ (air) | γ (vapor) |
|---|---|---|
| 0.0 | 31.58±0.2 | 31.70±0.15 |
| 10.0 | 30.22±0.05 | |
| 20.0 | 28.88±0.03 | 29.02±0.03 |
| 30.0 | 27.56±0.05 | 27.70 |
| 40.0 | 26.26±0.05 | |
| 50.0 | 24.98±0.1 | 25.08±0.10 |
| 60.0 | 23.72±0.1 | |
| 70.0 | 22.48±0.1 | 22.52±0.15 |
| 80.0 | 21.26±0.15 | |
| 100.0 | | 18.78±0.2 |
| 150.0 | | 12.86±0.2 |
| 200.0 | | 7.41±0.2 |
| 250.0 | | 2.66±0.2 |
| 270.0 | | 1.08±0.15 |
| 280.0 | | 0.42±0.1 |
| 285.0 | | 0.14 |
| 288.5 | | 0.00 |

$\gamma$ (air) = $31.58 - 0.137t + 0.0001t^2 \pm 0.2$, from 0°C to boiling point; $\gamma\ (\text{vapor}) = 71.926\left(1 - \frac{T}{561.6}\right)^{1.28} \pm 0.2$, from 0°C to $T_C$. $k_E = 2.22$, 0 to 100°C = 2.2, 0 to 220°C. At 20°C, $d_4^{20} = 0.8788$; $a^2$ (air) = 0.06713, $\gamma$ (vapor) − $\gamma$ (air) = 0.14.

$C_6H_6ClN$, *o*-Chloroaniline (III) (30)

| t, °C | γ ($N_2$) ±2† |
|---|---|
| −19 | 45.7 |
| +80.9 | 35.1 |
| 196.5 | 26.1 |

$C_6H_6ClN$, *p*-Chloroaniline (III) (81)

| t, °C | γ (air) ±1§§ |
|---|---|
| 81 | 39.72 |
| 117 | 35.79 |
| 133 | 34.06 |
| 153 | 31.93 |
| 185 | 28.57 |

$\gamma\ (\text{air}) = 81.37\left(1 - \frac{T}{787}\right)^{1.2}$

$C_6H_6N_2O_2$, *m*-Nitroaniline (III) (30)

| t, °C | γ ($N_2$) ±2† |
|---|---|
| 124.2 | 42.7 |
| 170 | 38.5 |
| 201.3 | 35.6 |

$C_6H_6N_2O_2$, *p*-Nitroaniline (III) (30)

| t, °C | γ ($N_2$) ±2† |
|---|---|
| 151 | 46.7 |
| 171.5 | 44.8 |
| 184.5 | 43.6 |

$C_6H_6O$, Phenol (I, II) $k_E = 1.85$ (1, 7, 28, 41, 42, 48, 93)

| t, °C | γ (air or vapor) |
|---|---|
| 0 | 43.1 ±0.4 |
| 20 | 40.9 ±0.3 |
| 30 | 39.88±0.2 |
| 50 | 37.70±0.2 |
| 80 | 34.42±0.2 |
| 100 | 32.24±0.2 |
| 150 | 26.8 ±0.3 |
| 180 | 23.6 ±0.4 |

$C_6H_6S$, Thiophenol (I, II) $k_E = 2.0$ (39, 89)

| t, °C | γ (air) ±0.5 |
|---|---|
| 10 | 41.0 |
| 20 | 39.8 |
| 45 | 36.7 |
| 75 | 33.1 |
| 90 | 31.3 |

$C_6H_7ClO_4$, Dimethyl chloromaleate (I) $k_E = 2.7$ (89)

| t, °C | γ (air) ±0.3 |
|---|---|
| 20.3 | 37.56 |
| 52.6 | 33.58 |
| 75.5 | 30.84 |
| 100.3 | 27.99 |

$C_6H_7ClO_4$, Dimethyl chlorofumarate (I, II) $k_E = 2.7$ (44, 89)

| t, °C | γ (air) |
|---|---|
| 20 | 39.0±0.4 |
| 50 | 35.4±0.4 |
| 100 | 29.3±0.3 |

$C_6H_7N$, Aniline (I, II, III) $k_E = 2.1$ (23, 40, 51, 62, 73, 81)

| t, °C | γ (air) ±0.4¶ |
|---|---|
| 10 | 44.0 |
| 20 | 42.9 |
| 50 | 39.4 |
| 100 | 33.7 |
| 150 | 27.9 |
| 180 | 24.4 |

$C_6H_7N$, α-Picoline (III) (30)

| t, °C | γ ($N_2$) ±2† |
|---|---|
| −70 | 47.4 |
| +46 | 31.3 |
| 126 | 22.5 |

$C_6H_8ClN$, Aniline hydrochloride (I) $k_E = 1.7$ (56)

| t, °C | γ ±*ca.* 1 |
|---|---|
| 211.8 | 39.3 |
| 232.5 | 37.6 |

For notes †–§§ *see* p. 475.

$C_6H_8N_2$, Phenylhydrazine (I) (83)

| t, °C | γ (?) |
|---|---|
| 20 | 46.1 |
| 30 | 44.8 |
| 50 | 42.1 |
| 60 | 40.8 |

(II) (39)

| t, °C | γ (air) |
|---|---|
| 30 | 43.5 |
| 50 | 42.2 |

$C_6H_8O_4$, Dimethyl fumarate (III) (82.4)

| t, °C | γ (air) ±1§§ |
|---|---|
| 106 | 25.67 |
| 123 | 23.77 |
| 132 | 22.75 |
| 146 | 21.20 |
| 163 | 19.18 |

$C_6H_8O_4$, Dimethyl maleate (III) (82.4)

| t, °C | γ (air) ±1§§ |
|---|---|
| 24 | 37.31 |
| 51 | 34.12 |
| 113 | 26.85 |
| 143 | 23.42 |

$C_6H_9O_6$, Triformin (III) (30)

| t, °C | γ ($N_2$) ±2† |
|---|---|
| 0 | 49.6 |
| 91.2 | 39.6 |
| 184.8 | 28.8 |

$C_6H_9NO_2$, Propyl cyanoacetate (III) (30)

| t, °C | γ ($N_2$) ±2† |
|---|---|
| −16 | 37.5 |
| +71 | 29.1 |
| 201 | 17.5 |

$C_6H_{10}$, 1, 5-Hexadiene (I) (72)

| t, °C | $a^2$ (air) ±1.5% | γ (air) |
|---|---|---|
| 4.1 | 0.05935 | |
| 58.4 | 0.04627 | 14.7 |

$C_6H_{10}O$, Mesityl oxide (I) (14, 16)

| t, °C | γ (air) |
|---|---|
| 24 | 28.3±0.5 |
| 75 | 22.8±0.8 |
| 125 | 17.4±1.0 |

$C_6H_{10}O_2$, Methylacetylacetone (I) $k_E = 2.2$ (92)

| t, °C | γ ±0.4 |
|---|---|
| 36.3 | 31.3 |
| 75.7 | 27.2 |
| 120.7 | 22.6 |

$C_6H_{10}O_3$, Ethyl acetoacetate (I, II) (39, 61, 69, 73)

| t, °C | γ (air or vapor) |
|---|---|
| 0 | 34.8 ±0.4 |
| 20 | 32.51±0.3 |
| 50 | 29.23±0.3 |
| 75 | 26.5 ±0.4 |
| 90 | 25.0 ±0.4 |
| 110 | 22.9 ±0.5 |
| 150 | 18.9 ±0.6 |

**$C_6H_{10}O_3$, Methyl $\alpha$-acetopropionate (I) (92)**

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 36.0 | 30.9 |
| 97.1 | 24.1 |
| 151.4 | 18.6 |

**$C_6H_{10}O_3$, Methyl methylacetoacetate (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −71 | 46.5 |
| +70.2 | 28.1 |
| 156 | 20.4 |

**$C_6H_{10}O_4$, Dimethyl succinate (III) (30)**

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 25.2 | 34.1 |
| 95 | 26.4 |
| 176.2 | 17.5 |

**$C_6H_{10}O_4$, Diethyl oxalate (I, II) (39, 73)**

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 10 | 33.2 |
| 20 | 32.0 |
| 50 | 28.7 |
| 70 | 26.6 |

**$C_6H_{10}O_6$, Dimethyl *d*-tartrate (I) $k_E = 2.0$ (37)**

| $t$, °C | $\gamma$‡‡ |
|---|---|
| 62.0 | 39.0 |
| 135.1 | 32.2 |

**$C_6H_{10}O_6$, Dimethyl *dl*-tartrate (I) $k_E = 2.0$ (37)**

| $t$, °C | $\gamma$‡‡ |
|---|---|
| 89.6 | 35.2 |
| 159.2 | 28.8 |

**$C_6H_{11}N$, Isoamyl cyanide (I) $k_E = 1.9$ (73, 83)**

| $t$, °C | $\gamma$ |
|---|---|
| 20 | 26.8±0.3 |
| 60 | 23.2±0.3 |
| 154 | 15.6±0.4 |

**$C_6H_{11}NO$, Mesityl oxide oxime (I) $k_E = 2.1$ (11)**

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 22.10 | 32.27 |
| 54.60 | 28.69 |
| 74.95 | 26.63 |
| 105.00 | 24.66 |

**$C_6H_{11}NO_2$, Ethyl $\beta$-aminocrotonate (I) (53)**

| $t$, °C | $\gamma$ (?) ±3 |
|---|---|
| 10 | 33 |
| 60 | 27 |

**$C_6H_{12}$, Cyclohexane, (II, III) (18, 30)**

| $t$, °C | $\gamma$ (air) |
|---|---|
| 10 | 26.9±1.0 |
| 20 | 25.3±0.3 |
| 80 | 15.7±1.5 |

**$C_6H_{12}O$, Cyclohexanol (II) (18)**

At 16.2°C, $\gamma$ (air) = 34.23 ± 0.3

**$C_6H_{12}O$, Ethyl propyl ketone (II) (23)**

At 20°C, $\gamma$ (air) = 25.39 ± 0.2

**$C_6H_{12}O$, Methyl *n*-butyl ketone (II) (23)**

At 20°C, $\gamma$ (air) = 25.49 ± 0.2

**$C_6H_{12}O$, Pinacolin (I) (73)**

$a^2 = 0.06440 - 0.000206t$; $\gamma$ = 15.1 at 105.5°C

| $t$, °C | $a^2$ ±2% |
|---|---|
| 8.6 | 0.06263 |
| 43.4 | 0.05546 |
| 60.2 | 0.05200 |
| 79.0 | 0.04813 |

**$C_6H_{12}O_2$, Isocaproic acid (I) $k_E = 1.7$ (61)**

| $t$, °C | $\gamma$ ±1.0 |
|---|---|
| 17.0 | 26.9 |
| 46.5 | 24.5 |
| 78.2 | 21.9 |
| 132.3 | 17.8 |

**$C_6H_{12}O_2$, *act.*-Amyl formate (I, II) $k_E = 2.2$ (29, 44)**

| $t$, °C | $\gamma$ (air or vapor) ±0.4‡ |
|---|---|
| 0 | 26.5 |
| 20 | 24.6 |
| 60 | 20.8 |
| 110 | 16.1 |

**$C_6H_{12}O_2$, Isoamyl formate (I) (65, 72)**

| $t$, °C | $\gamma$ (air or vapor) ±0.5 |
|---|---|
| 5 | 26.1 |
| 20 | 24.7 |
| 123 | 15.0 |

**$C_6H_{12}O_2$, Isobutyl acetate (I, II) (40, 65, 72)**

| $t$, °C | $\gamma$ (air) ±0.2 |
|---|---|
| 5 | 24.7 |
| 20 | 23.3 |
| 60 | 19.5 |
| 110 | 14.9 |

**$C_6H_{12}O_2$, Ethyl *n*-butyrate (I, II) (51, 64, 72)**

At 20°C, $a^2$ (air) = 0.0570$_2$; $d_4^{20} = 0.8789$

| $t$, °C | $\gamma$ (air) |
|---|---|
| 5.0 | 26.1 ±0.3 |
| 20.0 | 24.54±0.2 |
| 60.0 | 20.6 ±0.3 |
| 119.0 | 14.7 ±0.5 |

**$C_6H_{12}O_2$, Ethyl isobutyrate (I) (65, 72)**

| $t$, °C | $\gamma$ (air or vapor) |
|---|---|
| 5 | 24.83±0.3 |
| 20 | 23.25±0.2 |
| 110 | 13.85±0.3 |

**$C_6H_{12}O_2$, Methyl isovalerate (I) (65, 72)**

| $t$, °C | $\gamma$ (air or vapor) |
|---|---|
| 20 | 24.1±0.2 |
| 115 | 14.6±0.4 |

**$C_6H_{12}O_2$, *n*-Propyl propionate (I) (72)**

| $t$, °C | $a^2$ (air) ±1.5% | $\gamma$ (air) |
|---|---|---|
| 4.5 | 0.06040 | |
| 121.7 | 0.03804 | 14.3 |

**$C_6H_{12}O_3$, Paraldehyde (I, II) $k_E = 2.6$ (50, 72)**

| $t$, °C | $\gamma$ (air) ±0.5 |
|---|---|
| 5 | 27.5 |
| 20 | 25.9 |
| 50 | 22.6 |
| 124 | 14.5 |

**$C_6H_{13}NO_2$, Isopropylurethane (I) (17)**

| $t$, °C | $\gamma$ ±0.3 |
|---|---|
| 65.5 | 28.69 |
| 107.3 | 25.07 |
| 152.4 | 21.32 |

**$C_6H_{14}$, *n*-Hexane (I, II) (13, 21, 23, 39, 72)**

| $t$, °C | $\gamma$ (air) |
|---|---|
| 0 | 20.52±0.2 |
| 20 | 18.43±0.2 |
| 40 | 16.3 ±0.2 |
| 68 | 13.4 ±0.3 |

**$C_6H_{14}O$, Methyl isoamyl ether (I) (73)**

$a^2 = 0.060369 - 0.0002145t$

At 91.0°C, $\gamma$ = 13.82

| $t$, °C | $a^2$ ±2% |
|---|---|
| 6.5 | 0.05897 |
| 45.3 | 0.05065 |
| 72.6 | 0.04479 |
| 78.3 | 0.04357 |

**$C_6H_{14}O_2$, Acetal (I, II) (50, 72)**

| $t$, °C | $\gamma$ (air) ±0.2 |
|---|---|
| 5 | 23.2 |
| 20 | 21.65 |
| 40 | 19.6 |
| 100 | 13.5 |

**$C_6H_{15}N$, Di-*n*-propylamine (I, II) $k_E = 2.3$ (23, 83)**

| $t$, °C | $\gamma$ (air) |
|---|---|
| 20 | 22.54±0.1 |
| 30 | 21.5 ±0.2 |
| 60 | 18.4 ±0.3 |

**$C_6H_{15}N$, *n*-Hexylamine (III)**

| $t$, °C (30) | $\gamma$ ($N_2$) ±2† |
|---|---|
| −18 | 28.0 |
| +65 | 21.7 |
| 124.5 | 16.5 |

**$C_6H_{15}N$, Isohexylamine (III)**

| $t$, °C (30) | $\gamma$ ($N_2$) ±2† |
|---|---|
| −75 | 30.8 |
| +60 | 20.3 |
| 121 | 15.9 |

**$C_6H_{15}N$, Triethylamine (I, II) (41, 42, 73)**

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 0 | 22.9 |
| 20 | 20.9 |
| 40 | 18.8 |
| 90 | 13.7 |

**$C_6H_{15}O_4P$, Triethyl phosphate (III) (82)**

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 15.5 | 30.61 |
| 38.5 | 28.30 |
| 69.5 | 25.44 |
| 87.5 | 23.65 |

**$C_7H_5BrO$, Benzoyl bromide (I)**

| $t$, °C (14) | $a^2$ (air) ±2% |
|---|---|
| 120 | 0.0439 |
| 169 | 0.0380 |

**$C_7H_5ClO$, Benzoyl chloride (I) (73)**

At 194.5°C, $\gamma$ = 20.25

$a^2 = 0.06891 - 0.000150t$

| $t$, °C | $a^2$ ±2% |
|---|---|
| 9.8 | 0.06744 |
| 69.5 | 0.05849 |
| 81.5 | 0.05669 |
| 110.5 | 0.05234 |

**$C_7H_5N$, Benzonitrile (I, II) $k_E = 2.1$ (17, 51, 62, 73, 83)**

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 10 | 40.2 |
| 20 | 39.05 |
| 50 | 35.6 |
| 75 | 32.7 |
| 100 | 29.9 |
| 150 | 24.5 |
| 190 | 20.6 |

**$C_7H_5NS$, Phenyl isothiocyanate (I, II) $k_E = 2.4$ (7, 25, 39, 73)**

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 13 | 42.47 |
| 20 | 41.64 |
| 50 | 38.15 |
| 100 | 32.4 |
| 150 | 27.0 |
| 200 | 21.9 |
| 220 | 20.0 |

**$C_7H_6Cl_2$, Benzal chloride (I) (73)**

At 203.5°C, $\gamma$ = 20.2

$a^2 = 0.06432 - 0.000122t$

| $t$, °C | $a^2$ ±2% |
|---|---|
| 11.5 | 0.06292 |
| 48.5 | 0.05840 |
| 76.5 | 0.05499 |
| 93.0 | 0.05297 |

**$C_7H_6O$, Benzaldehyde (II) (23, 47)**

| $t$, °C | $\gamma$ (air) |
|---|---|
| 20 | 40.04±0.2 |
| 35 | 38.3 ±0.3 |
| 50 | 36.5 ±0.3 |

**$C_7H_6O_2$, Salicyl aldehyde (III)**

| $t$, °C (30) | $\gamma$ ($N_2$) ±2† |
|---|---|
| 0 | 44.8 |
| 90.5 | 35.0 |
| 190 | 24.9 |

**$C_7H_6O_2$, Toluquinone (III)**

$\gamma$ (air) (96)

For notes †–§§ *see* p. 475.

**$C_7H_7Br$, Benzyl bromide (I)** (14)

| $t$, °C | $a^2$ (air) ±2% |
|---|---|
| 110 | 0.0472 |
| 156 | 0.0400 |

**$C_7H_7Br$, *o* Bromotoluene (I, II)** (25, 73)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 20 | 34.85±0.2 |
| 180 | 18.6 ±0.5 |

**$C_7H_7Br$, *p*-Bromotoluene (III)** (81)

| $t$, °C | $\gamma$ (air) ±1.0§§ |
|---|---|
| 43 | 32.06 |
| 60 | 30.34 |
| 81 | 28.23 |
| 100 | 26.34 |
| 122 | 24.19 |
| 131 | 23.32 |
| 164 | 20.18 |

$$\gamma \text{ (air)} = 66.46\left(1 - \frac{T}{694}\right)^{1.2}$$

**$C_7H_7Cl$, Benzyl chloride (I)** (73)

$a^2 = 0.07287 - 0.0001719t$, $\gamma = 19.5$ at 178.5°C

| $t$, °C | $a^2$ ±2% |
|---|---|
| 10.0 | 0.07115 |
| 50.0 | 0.06428 |
| 75.0 | 0.05998 |

**$C_7H_7Cl$, *p*-Chlorotoluene (I, III)** (73, 81)

| $t$, °C | $\gamma$ (air or vapor) ±1§§ |
|---|---|
| 25 | 32.08 |
| 50 | 29.38 |
| 64 | 27.90 |
| 79 | 26.31 |
| 108 | 23.30 |
| 120 | 22.08 |
| 151 | 18.95 |

$$\gamma \text{ (air or vapor)} = 66.65\left(1 - \frac{T}{653}\right)^{1.2}$$

**$C_7H_7F$, *m*-Fluorotoluene (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −71 | 42.1 |
| +25.4 | 28.3 |
| 84.9 | 22.4 |

**$C_7H_7I$, *p*-Iodotoluene (III)** (81)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 39 | 35.66 |
| 59 | 33.64 |
| 78 | 31.73 |
| 100 | 29.56 |
| 122 | 27.35 |
| 140 | 25.68 |
| 166 | 23.20 |

$$\gamma \text{ (air)} = 69.28\left(1 - \frac{T}{734}\right)^{1.2}$$

**$C_7H_7NO$, Benzamide (I)** $k_E = 1.3$ (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 130 | 38.4 |
| 140 | 37.8 |
| 150 | 37.1 |
| 160 | 36.4 |
| 170 | 35.6 |

**$C_7H_7NO$, Formanilide (I)** $k_E = 1.6$ (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 60 | 39.4 |
| 75 | 38.1 |
| 90 | 36.8 |
| 105 | 35.4 |

**$C_7H_7NO_2$, *o*-Nitrotoluene (I, II, III)** (14, 23, 82.6)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 20 | 41.46±0.2 |
| 60 | 37.0 ±0.5 |
| 100 | 32.7 ±1 |
| 150 | 27.5 ±1.5 |
| 195 | 22.9 ±2 |

**$C_7H_7NO_2$, *m*-Nitrotoluene (II, III)** (23, 82.6)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 20 | 40.9±0.2 |
| 40 | 38.7±0.5 |
| 90 | 33.2±0.5 |
| 115 | 30.4±0.5 |

**$C_7H_7NO_2$, *p*-Nitrotoluene (III)** (81)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 56 | 37.23 |
| 77 | 35.02 |
| 95 | 33.15 |
| 122 | 30.39 |
| 138 | 28.78 |
| 155 | 27.07 |
| 179 | 24.70 |
| 220 | 20.68 |

$$\gamma \text{ (air)} = 74.06\left(1 - \frac{T}{754}\right)^{1.2}$$

**$C_7H_7NO_2$, Salicylamide (I)** $k_E = 1.4$ (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 140 | 40.8 |
| 150 | 40.0 |
| 160 | 39.3 |
| 170 | 38.4 |

**$C_7H_7NO_3$, *o*-Nitroanisole (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 25.4 | 48.4 |
| 117 | 38.4 |
| 212 | 26.5 |

**$C_7H_7NO_3$, *p*-Nitroanisole (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 60.5 | 40.9 |
| 144.5 | 33.1 |
| 220 | 24.5 |

For notes †–§§ *see* p. 475.

**$C_7H_8$, Toluene (I, II, III, IX)** $k_E = 2.2$ (20, 40, 43, 58, 62, 63, 72, 75, 89, 91)

| $t$, °C | $\gamma$ (air) | $\gamma$ (vapor) ±0.3 |
|---|---|---|
| 0 | 30.74±0.2 | |
| 10 | 29.60±0.1 | 27.7 |
| 20 | 28.43±0.05 | 28.5 |
| 30 | 27.30±0.1 | 27.4 |
| 40 | 26.13±0.1 | 26.2 |
| 50 | 24.99±0.2 | 25.0 |
| 60 | 23.81±0.2 | 23.8 |
| 80 | 21.53±0.2 | 21.5 |
| 100 | 19.39±0.2 | 19.4 |
| 130 | | 16.3 |

At 20°C, $a^2$ (air) = 0.06707; $d_4^{20} = 0.8658$

**$C_7H_8N_2O$, Phenylmethylnitrosoamine (I)** $k_E = 2.5$ (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 20 | 45.4 |
| 30 | 44.2 |
| 45 | 42.4 |
| 60 | 40.5 |
| 75 | 38.7 |
| 90 | 36.9 |

**$C_7H_8N_2O_2$, 2-Methyl-4-nitroaniline (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 142 | 43.0 |
| 184.5 | 36.3 |

**$C_7H_8N_2O_2$, 4-Methyl-2-nitroaniline (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 121 | 36.4 |
| 151 | 33.1 |
| 185 | 29.8 |

**$C_7H_8N_2O_2$, 2-Methyl-6-nitroaniline (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 105 | 39.2 |
| 151 | 35.2 |
| 201.2 | 30.7 |

**$C_7H_8N_2O_2$, *p*-Nitromethylaniline (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 155.2 | 46.3 |
| 186 | 43.7 |
| 210 | 40.1 |

**$C_7H_8O$, Benzyl alcohol (I, II)** $k_E = 1.6$ (18, 28, 65)

| $t$, °C | $\gamma$ (air or vapor) ±1 |
|---|---|
| 20 | 39.0 |
| 80 | 33.5 |

**$C_7H_8O$, *o*-Cresol (I)** $k_E = 2.0$ (7, 28, 62)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 10 | 39.8 |
| 40 | 36.7 |
| 70 | 33.5 |
| 100 | 30.4 |
| 150 | 25.1 |
| 180 | 22.0 |

**$C_7H_8O$, *m*-Cresol (I)** $k_E = 1.8$ (28, 62, 65)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 ¶ |
|---|---|
| 10 | 38.4 |
| 20 | 37.4 |
| 50 | 34.6 |
| 100 | 29.8 |
| 150 | 25.1 |
| 180 | 22.2 |

**$C_7H_8O$, *p*-Cresol (I)** $k_E = 1.7$ (28, 65)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 20 | 36.7 |
| 50 | 34.0 |
| 100 | 29.3 |

**$C_7H_8O$, Anisole (I, II)** $k_E = 2.3$ (17, 23, 51, 62, 73, 89)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 10 | 36.41±0.2 |
| 20 | 35.22±0.1 |
| 40 | 32.81±0.2 |
| 60 | 30.41±0.2 |
| 80 | 28.02±0.2 |
| 100 | 25.66±0.3 |
| 125 | 22.7 ±0.3 |
| 150 | 19.8 ±0.3 |

**$C_7H_8O_2$, Guaiacol (I)** $k_E = 2.2$ (61)

| $t$, °C | $\gamma$ |
|---|---|
| 19.6 | 38.66 |
| 46.0 | 35.66 |
| 78.0 | 31.90 |

(I) (14)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 142 | 28.1 |
| 179 | 23.9 |
| 201 | 21.3 |

**$C_7H_8O_2$, Resorcinol monomethyl ether (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| − 20 | 83.1 |
| +107 | 37.5 |
| 206 | 26.8 |

**$C_7H_8O_2$, Dimethyl-γ-pyrone (I)** $k_E = 1.9$ (55)

| $t$, °C | $\gamma$ (air)‡‡ |
|---|---|
| 137 | 30.8 |
| 183 | 26.3 |

**$C_7H_9N$, Benzylamine (I)** $k_E = 2.1$ (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 20 | 39.5 |
| 30 | 38.3 |
| 45 | 36.5 |
| 60 | 34.8 |
| 75 | 33.1 |

**$C_7H_9N$, Methylaniline (I, II)** (13, 40, 65)

| $t$, °C | $\gamma$ (air or vapor) |
|---|---|
| 10 | 40.7±0.3 |
| 20 | 39.6±0.3 |
| 60 | 35.3±0.3 |
| 195 | 21.0±0.5 |

**$C_7H_9N$, *o*-Toluidine (I, II, III)** (13, 27, 30, 31, 50, 65)

| $t$, °C | $\gamma$ (air or vapor) ±0.8 |
|---|---|
| 0 | 42.3 |
| 20 | 40.0 |
| 50 | 36.7 |
| 100 | 31.2 |
| 150 | 25.7 |
| 200 | 20.6 |

**$C_7H_9N$, *m*-Toluidine (I)** (65)
At 20°C, $\gamma$ = 36.9 ± 0.3

**$C_7H_9N$, *p*-Toluidine (I, II, III)** (13, 50, 81)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 50 | 34.6 |
| 100 | 29.8 |
| 150 | 25.0 |
| 210 | 19.3 |

**$C_7H_{10}O_4$, Dimethyl citraconate (III)** (82.4)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 20 | 35.69 |
| 32 | 34.51 |
| 53 | 31.37 |
| 64 | 30.78 |
| 79 | 28.20 |

**$C_7H_{10}O_4$, Dimethyl mesaconate (III)** (82.4)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 20 | 34.68 |
| 32 | 33.80 |
| 63 | 29.84 |
| 80 | 27.68 |

**$C_7H_{11}BrO_4$, Diethyl bromomalonate (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −20.7 | 39.1 |
| +66.6 | 29.3 |
| 146 | 24.2 |

**$C_7H_{11}Cl_3O_2$, *act.*-Amyl trichloroacetate (I, II)** (29, 44)

| $t$, °C | $\gamma$ (air or vapor) ±0.2‡ |
|---|---|
| 0 | 31.25 |
| 20 | 29.3 |
| 50 | 26.45 |
| 100 | 21.9 |
| 150 | 17.8±0.3 |

**$C_7H_{11}NO_2$, Butyl cyanoacetate (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| − 21.3 | 35.2 |
| +114.5 | 24.6 |
| 213.1 | 17.6 |

**$C_7H_{11}NO_2$, Isobutyl cyanoacetate (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −20.5 | 34.2 |
| +94.5 | 24.9 |
| 213 | 15.4 |

**$C_7H_{12}O_2$, Ethyl cyclobutanecarboxylate (III)** (82.7)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 19.5 | 29.96 |
| 47.5 | 26.58 |
| 70 | 24.10 |
| 90.5 | 21.68 |

**$C_7H_{12}O_4$, Diethyl malonate (II)** (39)

| $t$, °C | $\gamma$ (air) ±0.4 |
|---|---|
| 10 | 33.14 |
| 30 | 30.99 |
| 50 | 28.88 |

**$C_7H_{14}O$, Dipropyl ketone (II)** (44)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 10 | 26.69 |
| 30 | 24.71 |
| 40 | 23.75 |
| 60 | 21.93 |

**$C_7H_{14}O_2$, Heptylic acid (II)** (23)
At 20°C, $\gamma$ (air) = 28.31 ± 0.3

**$C_7H_{14}O_2$, Ethyl isovalerate (I, II)** (23, 72)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 20 | 23.68±0.1 |
| 130 | 13.2 ±0.4 |

**$C_7H_{14}O_2$, Isoamyl acetate (I, II)**
$k_E$ = 2.3 (47, 62, 72)

| $t$, °C | $\gamma$ (air) ±0.2 |
|---|---|
| 0 | 26.6 |
| 20 | 24.7 |
| 50 | 21.8 |
| 75 | 19.5 |
| 100 | 17.1 |
| 125 | 14.7 |
| 139 | 13.4 |

**$C_7H_{14}O_2$, Isobutyl propionate (I)** (72)

| $t$, °C | $a^2$ (air) ±1.5% | $\gamma$ (air) |
|---|---|---|
| 7.2 | 0.05906 | |
| 137 | 0.03544 | 13.0 |

**$C_7H_{14}O_2$, Propyl butyrate (I)** (72)

| $t$, °C | $a^2$ (air) ±1.5% | $\gamma$ (air) |
|---|---|---|
| 5.8 | 0.06117 | |
| 143.5 | 0.03621 | 13.2 |

**$C_7H_{14}O_2$, Propyl isobutyrate (I)** (72)

| $t$, °C | $a^2$ (air) ±1.5% | $\gamma$ (air) |
|---|---|---|
| 5.7 | 0.05906 | |
| 134.8 | 0.03544 | 12.9 |

**$C_7H_{15}NO$, Oenanthaldoxime (I)**
$k_E$ = 1.6 (11)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 54.60 | 26.38 |
| 76.78 | 24.78 |
| 107.15 | 22.41 |

For notes †–§§ *see* p. 475.

**$C_7H_{17}N$, *n*-Heptylamine (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −18.5 | 27.5 |
| +70.9 | 20.3 |
| 145.5 | 14.4 |

**$C_8H_4Cl_2O_2$, *sym.*-Phthalyl chloride (III)** $\gamma$ (air) (96)

**$C_8H_4Cl_2O_2$, *unsym.*-Phthalyl chloride** (96)

**$C_8H_7N$, Benzyl cyanide (I, II)**
$k_E$ = 2.2 (47, 83)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 20 | 41.8 |
| 45 | 39.0 |
| 60 | 37.3 |

**$C_8H_7N$, *o*-Tolunitrile (I, II, III)** (39, 82.6, 83)

| $t$, °C | $\gamma$ (air) ±0.5 |
|---|---|
| 20 | 38.2 |
| 40 | 36.0 |
| 75 | 32.1 |
| 100 | 29.5 |
| 116 | 28.0 |

**$C_8H_7N$, *m*-Tolunitrile (I, II, III)** (39, 82.6, 83)

| $t$, °C | $\gamma$ (air) ±0.5 |
|---|---|
| 0 | 39.8 |
| 20 | 37.7 |
| 40 | 35.5 |
| 85 | 30.7 |

**$C_8H_7N$, *p*-Tolunitrile (I, II, III)** (39, 82.6, 83)

| $t$, °C | $\gamma$ (air) ±0.2 |
|---|---|
| 30 | 36.8 |
| 40 | 35.7 |
| 70 | 32.3 |
| 96 | 29.7 |

**$C_8H_7NO$, Mandelonitrile (I)**
$k_E$ = 1.9 (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 20 | 44.3 |
| 30 | 43.4 |
| 45 | 41.9 |
| 60 | 40.4 |

**$C_8H_8$, Styrene (II)** (18)
At 19°C, $\gamma$ (air) = 32.14 ± 0.3

**$C_8H_8N_2O_6$, 4, 5-Dinitro-1, 2-dimethoxybenzene (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 130.8 | 41.0 |
| 182 | 35.7 |
| 208 | 31.5 |

**$C_8H_8O$, Acetophenone (I, II)**
$k_E$ = 2.2 (13, 14, 50)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 20 | 39.8 |
| 50 | 36.2 |
| 75 | 33.3 |
| 125 | 27.8 |
| 175 | 22.8 |

**$C_8H_8O_2$, *p*-Methoxybenzaldehyde (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 0 | 44.9 |
| 101 | 33.7 |
| 210 | 22.9 |

**$C_8H_8O_2$, Methyl benzoate (I)**
$k_E$ = 2.4 (62, 73)

| $t$, °C | $\gamma$ (air or vapor) |
|---|---|
| 10 | 38.8±0.2 |
| 20 | 37.6±0.2 |
| 50 | 34.2±0.3 |
| 75 | 31.2±0.3 |
| 100 | 28.4±0.3 |
| 150 | 23.0±0.3 |
| 200 | 17.6±0.3 |

**$C_8H_8O_3$, Methyl salicylate (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −19.8 | 44.2 |
| +94 | 31.9 |
| 212.2 | 19.8 |

**$C_8H_9NO$, Acetanilide (I)**
$k_E$ = 1.9 (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 120 | 35.6 |
| 130 | 34.7 |
| 145 | 33.3 |
| 160 | 32.0 |

**$C_8H_9NO$, *anti*-Benzaldoxime *N*-methyl ether (III)** (82)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 100 | 40.93 |
| 122 | 38.62 |
| 141 | 36.80 |
| 163 | 34.53 |

**$C_8H_9NO$, *anti*-Benzaldoxime *O*-methyl ether (III)** (82)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 16.5 | 37.03 |
| 33.5 | 34.92 |
| 55.5 | 32.20 |
| 73 | 30.13 |

**$C_8H_9NO$, Phenylacetamide (I)**
$k_E$ = 1.6 (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 160 | 34.0 |
| 170 | 33.2 |
| 180 | 32.4 |

**$C_8H_9NO_3$, *p*-Nitrophenetole (III)** (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 70.2 | 35.3 |
| 140 | 29.3 |
| 220 | 22.6 |

**$C_8H_{10}$, Ethylbenzene (I, II)** (18, 40, 65, 66, 72)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 0 | 31.40±0.2 |
| 20 | 29.20±0.2 |
| 35 | 27.60±0.2 |
| 60 | 24.91±0.2 |
| 135 | 16.9 ±0.3 |

$C_8H_{10}$, *o*-Xylene (I, II) (23, 40, 66)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 0 | 32.27 |
| 20 | 30.10 |
| 40 | 27.90 |
| 60 | 25.70 |

$C_8H_{10}$, *m*-Xylene (I) $k_E = 2.25$ (20, 62, 65, 66, 72, 89)

| $t$, °C | $\gamma$ (air) ¶ | $\gamma$ (vapor) ±0.4 |
|---|---|---|
| 0 | 31.15 ±0.1 | 31.15 |
| 20 | 28.90 ±0.1 | 28.90 |
| 40 | 26.70 ±0.1 | 26.70 |
| 60 | 24.57 ±0.1 | 24.57 |
| 100 | 20.46 ±0.2 | 20.46 |
| 135 | 17.18 ±0.3 | 17.18 |

$C_8H_{10}$, *p*-Xylene (II) (23, 40, 65, 66, 72)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 5 | 29.92 ±0.2 |
| 20 | 28.37 ±0.1 |
| 35 | 26.80 ±0.2 |
| 60 | 24.20 ±0.2 |
| 135 | 16.7 ±0.3 |

$C_8H_{10}O$, *p*-Tolyl methyl ether (I) (73)

$a^2 = 0.075037 - 0.0001838t$

| $t$, °C | $a^2$ ±2% | $\gamma$ |
|---|---|---|
| 5.5 | 0.0740 | |
| 48.7 | 0.0661 | |
| 75.5 | 0.0612 | |
| 92.5 | 0.0580 | |
| 175.5 | 0.0428 | 17.4 |

$C_8H_{10}O$, Phenetole (I, II) $k_E = 2.4$ (23, 51, 62, 73)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 20 | 32.74 ±0.1 |
| 50 | 29.5 ±0.2 |
| 100 | 24.2 ±0.2 |
| 150 | 18.9 ±0.2 |
| 170 | 16.8 ±0.2 |

$C_8H_{10}O_2$, *o*-Dimethoxybenzene (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 0.0 | 42.5 |
| 104.5 | 29.3 |
| 196 | 20.8 |

$C_8H_{10}O_2$, *m*-Dimethoxybenzene (I) (73)

$a^2 = 0.077718 - 0.0001709t$

At 215°C, $\gamma = 17.6$

| $t$, °C | $a^2$ ±2% |
|---|---|
| 10.6 | 0.0759 |
| 72.0 | 0.0654 |
| 87.0 | 0.0628 |

$C_8H_{10}O_2$, *p*-Dimethoxybenzene (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 66 | 34.7 |
| 146 | 26.4 |
| 206 | 19.5 |

$C_8H_{10}O_4$, Dimethyl 3-methyl-$\Delta^2$-cyclopropene-1, 2-dicarboxylate (III) (82.7)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 42 | 35.46 |
| 63 | 32.94 |
| 81 | 30.79 |
| 95 | 28.98 |

$C_8H_{11}ClO_4$, Diethyl chlorofumarate (I, II) $k_E = 2.8$ (44, 89)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 15 | 34.8 |
| 40 | 32.3 |
| 60 | 30.2 |

$C_8H_{11}ClO_4$, Diethyl chloromaleate (I) $k_E = 2.6$ (89)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 15.5 | 34.45 |
| 26.3 | 33.33 |
| 50.0 | 30.83 |
| 70.75 | 28.77 |
| 97.05 | 26.19 |

$C_8H_{11}N$, Dimethylaniline (I, II) $k_E = 2.4$ (20, 40, 62, 63)

At 20°C, $a^2$ (air) = 0.07811; $\gamma$ (vapor) − $\gamma$ (air) = 0.10; $d_4^{20} = 0.9562$

| $t$, °C | $\gamma$ (air) |
|---|---|
| 10 | 37.70 ±0.1 |
| 20 | 36.56 ±0.05 |
| 50 | 33.20 ±0.1 |
| 75 | 30.39 ±0.2 |
| 100 | 27.6 ±0.3 |
| 150 | 22.4 ±0.3 |
| 175 | 20.0 ±0.3 |

$C_8H_{11}N$, Ethylaniline (I, II) (13, 31, 40, 65)

| $t$, °C | $\gamma$ (air or vapor) ±0.5 |
|---|---|
| 10 | 37.6 |
| 20 | 36.6 |
| 60 | 32.4 |
| 210 | 16.7 |

$C_8H_{11}NO_2$, Ethyl 1-cyanocyclobutane-1-carboxylate (III) (82.7)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 13.5 | 35.68 |
| 57 | 30.92 |
| 84.5 | 27.86 |
| 126.5 | 23.49 |

$C_8H_{12}BrN$, Phenyldimethylammonium bromide (I) $k_E = 1.7$ (88)

| $t$, °C | $\gamma$ (air) ±0.5 |
|---|---|
| 82.0 | 51.60 |
| 97.0 | 50.24 |
| 113.5 | 48.77 |

$C_8H_{12}O_4$, Diethyl fumarate (I, II) $k_E = 2.7$ (44, 89)

| $t$, °C | $\gamma$ (air) ±0.4 |
|---|---|
| 20 | 32.4 |
| 45 | 29.8 |
| 75 | 26.6 |

$C_8H_{12}O_4$, Diethyl maleate (I) $k_E = 2.6$ (89)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 19.8 | 33.38 |
| 41.4 | 31.08 |
| 79.35 | 27.33 |

$C_8H_{13}BrO_4$, Diethyl methylbromomalonate (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| − 21 | 35.0 |
| +114 | 22.6 |
| 197 | 14.7 |

$C_8H_{13}NO_2$, Amyl cyanoacetate (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −17.5 | 32.7 |
| +89 | 25.0 |
| 201 | 17.8 |

$C_8H_{14}$, *n*-Hexylacetylene (I) $k_E = 2.4$ (90)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 23.0 | 23.89 |
| 39.0 | 22.22 |
| 57.0 | 20.40 |
| 73.6 | 18.75 |
| 92.8 | 16.92 |

$C_8H_{14}O_3$, Ethyl dimethylacetoacetate (II) (39)

| $t$, °C | $\gamma$ (air) ±0.4 |
|---|---|
| 30 | 29.61 |
| 40 | 28.51 |
| 50 | 27.39 |

$C_8H_{14}O_3$, Ethyl ethylacetoacetate (I) $k_E = 2.4$ (92)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 38.8 | 28.1 |
| 97.8 | 22.3 |
| 148.3 | 17.6 |

$C_8H_{14}O_4$, Diethyl succinate (I) $k_E = 2.3$ (31)

| $t$, °C | $\gamma$ (?) ±2 |
|---|---|
| 13.0 | 31.9 |
| 70.6 | 26.5 |

$C_8H_{14}O_5$, Diethyl malate (II) (44)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 30 | 35.51 |
| 40 | 32.55 |
| 60 | 30.63 |

$C_8H_{14}O_6$, Diethyl *d*-tartrate (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 25 | 37.6 |
| 134.7 | 26.9 |
| 212.7 | 20.2 |

$C_8H_{16}$, *n*-Octylene (mixture of 1-*n*-octylene and 2-*n*-octylene) (I, II) (18, 72)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 2 | 24.0 |
| 20 | 22.2 |
| 125 | 12.4 |

For notes †–§§ see p. 475.

$C_8H_{16}O$, Methyl hexyl ketone (II) (23, 47)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 0 | 28.6 ±0.2 |
| 20 | 26.79 ±0.1 |
| 30 | 25.9 ±0.2 |

$C_8H_{16}O_2$, Caprylic acid (II) (18)

At 18.1°C, $\gamma$ (air) = 28.82 ± 0.3

$C_8H_{16}O_2$, Ethyl caproate (II) (20)

At 20°C, $\gamma$ (air) = 25.81 ± 0.2

$C_8H_{16}O_2$, Isoamyl propionate (I) (72)

| $t$, °C | $a^2$ (air) ±1.5% | $\gamma$ (air) |
|---|---|---|
| 4.5 | 0.06152 | |
| 160.5 | 0.03459 | 12.4 |

$C_8H_{16}O_2$, Isobutyl *n*-butyrate (I) (72)

| $t$, °C | $a^2$ (air) ±1.5% | $\gamma$ (air) |
|---|---|---|
| 5.8 | 0.06046 | |
| 157 | 0.03361 | 12.0 |

$C_8H_{16}O_2$, Isobutyl isobutyrate (I) (72)

| $t$, °C | $a^2$ (air) ±2% | $\gamma$ (air) |
|---|---|---|
| 7.9 | 0.0583 | |
| 149 | 0.0337 | 12.0 |

$C_8H_{16}O_2$, *n*-Propyl isovalerate (I) (72)

| $t$, °C | $a^2$ (air) ±1.5% | $\gamma$ (air) |
|---|---|---|
| 15 | 0.05857 | |
| 155.5 | 0.03459 | 12.4 |

$C_8H_{18}$, 2, 5-Dimethylhexane (I) (66, 72)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 0 | 21.95 ±0.2 |
| 30 | 18.97 ±0.2 |
| 60 | 16.16 ±0.2 |
| 110 | 11.5 ±0.3 |

$C_8H_{18}$, 2-Methylheptane (I) (66)

| $t$, °C | $p$* | $\gamma$ ±0.1 |
|---|---|---|
| 0.0 | 9.6 | 22.85 |
| 34.3 | 10.4 | 19.48 |
| 61.0 | 57.2 | 16.94 |

* $p$ = pressure of air + vapor (in cm of mercury).

$C_8H_{18}$, *n*-Octane (I, II) $k_E = 2.3$ (20, 21, 61, 66)

| $t$, °C | $\gamma$ (air) ±0.1 | $\gamma$ (vapor) ±0.3 |
|---|---|---|
| 0 | 23.80 | 23.80 |
| 20 | 21.80 | 21.80 |
| 40 | 19.82 | 19.82 |
| 60 | 17.88 | 17.88 |

$C_8H_{18}O$, *dl*-Methylhexyl carbinol (II) $k_E = 2.1$ (9, 21, 23)

| $t$, °C | $\gamma$ (air) ±0.1 |
|---|---|
| 0 | 27.96 |
| 20 | 26.37 |
| 40 | 24.78 |
| 60 | 23.02 |

$C_8H_{18}O$, *d*-Methylhexyl carbinol (I) $k_E = 2.0$ [76]

| *t*, °C | $\gamma$** |
|---|---|
| 10 | 26.6 |
| 80 | 20.8 |

$C_8H_{18}O$, *l*-Methylhexyl carbinol (I) $k_E = 1.9$ [76]

| *t*, °C | $\gamma$** |
|---|---|
| 10 | 26.5 |
| 80 | 20.9 |

$C_8H_{18}O$, *n*-Octyl alcohol (II) [20, 21]

| *t*, °C | $\gamma$ (air) ±0.2 |
|---|---|
| 0.16 | 29.09 |
| 20.00 | 27.53 |
| 39.87 | 25.85 |
| 59.67 | 24.38 |

$C_8H_{19}N$, Diisobutylamine (II, III) [23, 30]

| *t*, °C | $\gamma$ (air) |
|---|---|
| −70 | 30.0 ±1.5 |
| +20 | 22.05±0.2 |
| 125 | 12.7 ±1.5 |

$C_9H_7N$, Quinoline (I, II) $k_E = 2.4$ [7, 40, 45, 62, 73]

| *t*, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 10 | 46.2 |
| 20 | 45.0 |
| 50 | 41.5 |
| 100 | 35.8 |
| 150 | 30.3 |
| 200 | 25.1 |
| 230 | 22.1 |

$C_9H_{10}O_2$, Ethyl benzoate (I, III) [30, 31, 73]

| *t*, °C | $\gamma$ ±0.5 |
|---|---|
| 0 | 37.5 |
| 20 | 35.5 |
| 50 | 32.5 |
| 75 | 30.0 |
| 200 | 17.5 |

$C_9H_{10}O_3$, Ethyl *m*-hydroxybenzoate (I) $k_E = 2.2$ [28]

| *t*, °C | $\gamma$ ±0.4 |
|---|---|
| 85.8 | 35.76 |
| 115.4 | 32.99 |
| 143.5 | 30.28 |

$C_9H_{10}O_3$, Ethyl *p*-hydroxybenzoate (I) $k_E = 2.2$ [28]

| *t*, °C | $\gamma$ ±0.4 |
|---|---|
| 119.7 | 33.71 |
| 149.3 | 31.01 |
| 172.8 | 28.80 |

$C_9H_{10}O_3$, Ethyl salicylate (I) $k_E = 2.4$ [28]

| *t*, °C | $\gamma$ ±0.4 |
|---|---|
| 20.5 | 38.33 |
| 61.1 | 35.06 |
| 85.6 | 31.37 |

$C_9H_{11}NO$, Methylacetanilide (I) $k_E = 2.2$ [83]

| *t*, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 105 | 32.4 |
| 115 | 31.5 |

$C_9H_{11}NO$.—(*Continued*)

| *t*, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 120 | 31.0 |
| 130 | 30.0 |
| 145 | 28.5 |

$C_9H_{11}NO_2$, Phenylurethane (I) $k_E = 2.2$ [17, 83]

| *t*, °C | $\gamma$ (?) ±0.4 |
|---|---|
| 60 | 36.5 |
| 80 | 34.5 |
| 100 | 32.5 |
| 150 | 27.6 |

$C_9H_{12}$, *p*-Ethyltoluene (I) [72]

| *t*, °C | $a^2$ (air) ±1.5% | $\gamma$ (air) |
|---|---|---|
| 4.5 | 0.07088 | |
| 161.8 | 0.04184 | 15.2 |

$C_9H_{12}$, Mesitylene (I, II) $k_E = 2.2$ [23, 40, 62, 72]

| *t*, °C | $\gamma$ (air) |
|---|---|
| 5 | 30.1 ±0.2 |
| 20 | 28.51±0.2 |
| 50 | 25.5 ±0.2 |
| 75 | 23.0 ±0.3 |
| 100 | 20.6 ±0.3 |
| 125 | 18.2 ±0.3 |
| 165 | 14.9 ±0.3 |

$C_9H_{12}$, *n*-Propylbenzene (I) [72]

| *t*, °C | $\gamma$ (air) ±0.4 |
|---|---|
| 4.5 | 30.6 |
| 158.7 | 15.3 |

$C_9H_{12}$, Pseudocumene (III) [30]

| *t*, °C | $\gamma$ ($N_2$) ±2.0† |
|---|---|
| −21 | 34.1 |
| +86.5 | 24.0 |
| 166 | 16.2 |

$C_9H_{12}O$, *dl*-Phenylethyl carbinol (I) $k_E = 2.0$ [76]

| *t*, °C | $\gamma$‡‡ |
|---|---|
| 10 | 34.9 |
| 80 | 28.4 |

$C_9H_{12}O$, *l*-Phenylethyl carbinol (I) $k_E = 2.0$ [76]

| *t*, °C | $\gamma$‡‡ |
|---|---|
| 10 | 34.7 |
| 80 | 28.3 |

$C_9H_{13}N$, Dimethyl-*o*-toluidine (I) [13, 27]

| *t*, °C | $\gamma$ ±1.0 |
|---|---|
| 15 | 32.9 |
| 150 | 18.2 |

$C_9H_{14}O$, Phorone (I) [14]

| *t*, °C | $a^2$ (air) ±2% |
|---|---|
| 132 | 0.0520 |
| 160 | 0.0470 |
| 191 | 0.0418 |

$C_9H_{14}O_3$, Ethyl allylacetoacetate (I) $k_E = 2.6$ [92]

| *t*, °C | $\gamma$ ±0.4 |
|---|---|
| 39.2 | 28.5 |
| 105.7 | 22.2 |
| 121.2 | 20.8 |

For notes †–§§ *see* p. 475.

$C_9H_{14}O_4$, Diethyl cyclopropane-1, 1-dicarboxylate (III) [82.7]

| *t*, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 25 | 31.28 |
| 110 | 22.62 |
| 153 | 18.52 |
| 189 | 15.52 |

$C_9H_{14}O_4$, Diethyl cyclopropane-1, 2-dicarboxylate (III) [82.7]

| *t*, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 11 | 33.41 |
| 14 | 33.22 |
| 54 | 28.92 |
| 71 | 27.29 |
| 90 | 25.17 |

$C_9H_{14}O_6$, Glyceryl triacetate (III) [30]

| *t*, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −19 | 37.8 |
| +99.8 | 30.1 |
| 200.3 | 20.4 |

$C_9H_{16}O_3$, Ethyl *n*-?-propylacetoacetate (III) [30]

| *t*, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −76.2 | 43.6 |
| +70 | 24.8 |
| 200.5 | 14.2 |

$C_9H_{17}BrO_2$, *act.*-Amyl $\alpha$ (?)-bromo-*n*-butyrate (I) $k_E = 2.6$ [90]

| *t*, °C | $\gamma$ (air) ±0.3‡ |
|---|---|
| 17.1 | 29.55 |
| 44.9 | 26.96 |
| 75.8 | 24.12 |
| 103.5 | 21.50 |

$C_9H_{18}O_2$, *act.*-Amyl butyrate (I, II) $k_E = 2.4$ [29, 44]

| *t*, °C | $\gamma$ (air or vapor) ±0.3‡ |
|---|---|
| 0 | 27.1 |
| 20 | 25.2 |
| 60 | 21.5 |
| 80 | 19.8 |
| 110 | 17.3 |

$C_9H_{18}O_2$, Isoamyl butyrate (II) [23]

At 20°C, $\gamma$ (air) = 25.19 ± 0.2

$C_9H_{18}O_2$, Isobutyl isovalerate (I, II) $k_E = 2.6$ [29, 44]

| *t*, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 0 | 26.1 |
| 20 | 24.2 |
| 60 | 20.6 |
| 105 | 16.5 |

$C_9H_{20}$, Tetraethylmethane (I) $k_E = 2.2$ [38]

| *t*, °C | $\gamma$‡‡ |
|---|---|
| 20 | 22.9 |
| 40 | 21.2 |

$C_9H_{21}N$, Tri-*n*-propylamine (I) $k_E = 2.7$ [83]

| *t*, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 20 | 23.2 |
| 30 | 22.3 |

$C_9H_{21}N$.—(*Continued*)

| *t*, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 45 | 20.8 |
| 60 | 19.4 |
| 75 | 18.0 |

$C_{10}H_7Br$, $\alpha$-Bromonaphthalene (II) [25]

At 20°C, $\gamma$ (air) = 44.59 ± 0.3

$C_{10}H_7Cl$, $\alpha$-Chloronaphthalene (II) [25]

At 20°C, $\gamma$ (air) = 41.80 ± 0.3

$C_{10}H_8$, Naphthalene (I) [13, 14]

| *t*, °C | $\gamma$ (air or vapor) ±1 |
|---|---|
| 127 | 28.8 |
| 170 | 24.0 |
| 190 | 21.8 |

$C_{10}H_9BrO_2$, Methyl $\alpha$-bromoallocinnamate (III) [82.4]

| *t*, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 20 | 43.41 |
| 30 | 42.30 |
| 60 | 38.77 |
| 81 | 36.10 |

$C_{10}H_9BrO_2$, Methyl $\beta$-bromoallocinnamate (III) [82.4]

| *t*, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 66 | 36.04 |
| 71 | 35.23 |
| 86 | 33.54 |
| 94 | 32.70 |

$C_{10}H_9BrO_2$, Methyl $\alpha$-bromocinnamate (III) [82.4]

| *t*, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 20 | 45.59 |
| 51 | 41.80 |
| 81 | 38.22 |
| 131 | 31.57 |

$C_{10}H_9BrO_2$, Methyl $\beta$-bromocinnamate (III) [82.4]

| *t*, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 20 | 44.79 |
| 32 | 42.36 |
| 61 | 39.96 |
| 77 | 37.49 |

$C_{10}H_{10}O$, Benzylideneacetone (I) $k_E = 2.6$ [16]

| *t*, °C | $\gamma$ (air) ±*ca.* 1.5 |
|---|---|
| 60.0 | 39.9 |
| 67.8 | 39.2 |
| 80.0 | 37.9 |
| 110.5 | 34.3 |
| 137.5 | 31.5 |
| 155.0 | 29.6 |
| 199.0 | 25.2 |

$C_{10}H_{10}O_2$, Methyl allocinnamate (III) [82.4]

| *t*, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 20 | 40.17 |
| 41 | 37.53 |
| 62 | 34.93 |
| 78 | 32.88 |

$C_{10}H_{10}O_2$, Methyl cinnamate (I, II, III) (39, 82.4, 89)

| $t$, °C | $\gamma$ (air) ±0.5 |
|---|---|
| 20 | 39.5 |
| 50 | 36.5 |
| 100 | 31.4 |

$C_{10}H_{12}O$, Anethole (I, II) $k_E = 2.3$ (50, 62)

| $t$, °C | $\gamma$ (air) ±0.5 |
|---|---|
| 10 | 37.6 |
| 20 | 36.5 |
| 50 | 33.3 |
| 100 | 28.4 |
| 150 | 23.8 |
| 200 | 19.6 |
| 220 | 18.1 |

$C_{10}H_{12}O$, Cumic aldehyde (I) (73)

$a^2 = 0.07397 - 0.0001505t$

At 237.0°C, $\gamma = 14.8$

| $t$, °C | $a^2$ ±2% |
|---|---|
| 8.8 | 0.07265 |
| 48.4 | 0.06669 |
| 70.5 | 0.06336 |
| 94.5 | 0.05975 |
| 125.5 | 0.05509 |

$C_{10}H_{12}O_3$, Methyl *d*-β-hydroxy-β-phenylpropionate (I) $k_E = 2.4$ (76)

| $t$, °C | $\gamma$‡‡ |
|---|---|
| 10 | 40.7 |
| 80 | 33.3 |

$C_{10}H_{12}O_3$, Methyl *dl*-β-hydroxy-β-phenylpropionate (I) $k_E = 2.4$ (76)

| $t$, °C | $\gamma$‡‡ |
|---|---|
| 10 | 40.0 |
| 80 | 33.1 |

$C_{10}H_{13}NO$, Ethylacetanilide (I) $k_E = 2.6$ (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 60 | 34.6 |
| 75 | 33.1 |
| 90 | 31.5 |
| 105 | 29.9 |

$C_{10}H_{14}$, 1, 2, 4, 5-Tetramethylbenzene (I) (13)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 108.5 | 22.07 |
| 210.2 | 13.45 |

$C_{10}H_{14}$, *p*-Isopropyltoluene (I, II) $k_E = 2.3$ (18, 23, 40, 62, 72)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 5 | 29.5±0.2 |
| 20 | 28.1±0.1 |
| 50 | 25.3±0.2 |
| 100 | 20.7±0.2 |
| 150 | 16.1±0.3 |
| 176 | 13.8±0.4 |

$C_{10}H_{14}O$, Carvol (I) (73)

$z^2 = 0.076947 - 0.0001611t$

At 227.5°C, $\gamma = 15.6$

$C_{10}H_{14}O$.—(*Continued*)

| $t$ | $a^2$ ±2% |
|---|---|
| 10.5 | 0.07525 |
| 45.7 | 0.06757 |
| 91.5 | 0.06220 |
| 137.5 | 0.05479 |

$C_{10}H_{14}O$, *dl*-β-Phenylethylmethyl carbinol (I) $k_E = 2.2$ (76)

| $t$, °C | $\gamma$‡‡ |
|---|---|
| 10 | 36.7 |
| 80 | 30.1 |

$C_{10}H_{14}O$, *d*-β-Phenylethylmethyl carbinol (I) $k_E = 2.0$ (76)

| $t$, °C | $\gamma$‡‡ |
|---|---|
| 10 | 36.5 |
| 80 | 30.3 |

$C_{10}H_{14}O$, *l*-β-Phenylethylmethyl carbinol (I) $k_E = 2.2$ (76)

| $t$, °C | $\gamma$‡‡ |
|---|---|
| 10 | 36.7 |
| 80 | 30.2 |

$C_{10}H_{14}O$, Thymol (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 0 | 34.2 |
| 115 | 25.3 |
| 211 | 17.9 |

$C_{10}H_{14}O_4$, "labile" Diethyl 3-methyl-$\Delta^2$-cyclopropene-1, 2-dicarboxylate (III) (82.7)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 26 | 33.98 |
| 50 | 31.13 |
| 77 | 27.99 |

$C_{10}H_{14}O_4$, "normal" Diethyl 3-methyl-$\Delta^2$-cyclopropene-1, 2-dicarboxylate (III) (82.7)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 41.5 | 31.42 |
| 51 | 30.33 |
| 62 | 29.12 |
| 77.5 | 27.52 |

$C_{10}H_{15}N$, Diethylaniline (I) (13, 31, 65)

| $t$, °C | $\gamma$ |
|---|---|
| 15 | 34.7±0.3 |
| 20 | 34.2±0.3 |
| 50 | 31.1±0.3 |
| 110 | 24.9±0.5 |
| 210 | 14.7±0.7 |

$C_{10}H_{16}$, *dl*-Limonene (I) $k_E = 2.3$ (37)

| $t$, °C | $\gamma$‡‡ |
|---|---|
| 10 | 28.1 |
| 90 | 20.8 |

$C_{10}H_{16}$, *d*-Limonene (I) $k_E = 2.3$ (37)

| $t$, °C | $\gamma$‡‡ |
|---|---|
| 10.9 | 28.5 |
| 90.3 | 21.2 |

$C_{10}H_{16}$, *l*-Limonene (I) $k_E = 2.2$ (37)

| $t$, °C | $\gamma$‡‡ |
|---|---|
| 6.2 | 28.5 |
| 95.5 | 20.5 |

$C_{10}H_{16}$, *dl*-Pinene (I) $k_E = 2.3$ (37)

| $t$, °C | $\gamma$‡‡ |
|---|---|
| 10 | 27.0 |
| 90 | 19.5 |

$C_{10}H_{16}$, *d*-Pinene (I) $k_E = 2.4$ (37)

| $t$, °C | $\gamma$‡‡ |
|---|---|
| 12.6 | 27.2 |
| 91.4 | 19.8 |

$C_{10}H_{16}$, *l*-Pinene (I) $k_E = 2.3$ (37)

| $t$, °C | $\gamma$‡‡ |
|---|---|
| 11.4 | 27.3 |
| 93.8 | 19.6 |

$C_{10}H_{16}$, Sylvestrene (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −70 | 35.7 |
| +55.5 | 23.2 |
| 149.5 | 14.6 |

$C_{10}H_{16}$, Terebene (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −74 | 35.8 |
| +86.3 | 21.1 |
| 170 | 13.9 |

$C_{10}H_{16}O_2$, α-Campholenic acid (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 0 | 37.0 |
| 117 | 26.4 |
| 212 | 18.8 |

$C_{10}H_{16}O_4$, Diethyl cyclobutane-1, 1-dicarboxylate (III) (82.7)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 15 | 32.51 |
| 49 | 28.70 |
| 81 | 25.24 |

$C_{10}H_{18}O$, Linalool (I) $k_E = 2.3$ (62)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 8.0 | 28.74 |
| 34.0 | 26.42 |
| 55.0 | 24.55 |
| 78.0 | 22.83 |
| 109.0 | 20.20 |
| 124.7 | 18.85 |

$C_{10}H_{18}O_2$, α-Dihydrocampholenic acid (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 0 | 34.3 |
| 95 | 25.3 |
| 195.3 | 18.9 |

$C_{10}H_{18}O_3$, Ethyl diethylacetoacetate (II) (39)

| $t$, °C | $\gamma$ (air) ±0.4 |
|---|---|
| 30 | 28.24 |
| 40 | 27.25 |
| 50 | 26.29 |

For notes †–§§ *see* p. 475.

$C_{10}H_{22}$, Diisoamyl (I, II) (23, 47, 72)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 0 | 23.96±0.2 |
| 20 | 22.24±0.1 |
| 30 | 21.41±0.2 |
| 160 | 10.7 ±0.3 |

$C_{10}H_{22}O$, Isoamyl ether (I) $k_E = 2.2$ (31)

| $t$, °C | $\gamma$ (?) ±2 |
|---|---|
| 17.8 | 23.2 |
| 64.0 | 19.5 |

$C_{10}H_{23}N$, Diisoamylamine (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −20 | 26.5 |
| +80.8 | 17.9 |
| 178.5 | 10.8 |

$C_{11}H_{10}O_2$, Ethyl phenylpropiolate (I) $k_E = 2.4$ (89)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 15.6 | 39.68 |
| 35.4 | 37.57 |
| 66.5 | 34.31 |
| 81.5 | 32.78 |
| 99.9 | 30.94 |

$C_{11}H_{12}O$, Benzylidene methyl ethyl ketone (I) $k_E = 2.7$ (16)

| $t$, °C | $\gamma$ (air) ±*ca.* |
|---|---|
| 59.5 | 1.5 |
| 67.0 | 38.5 |
| 82.0 | 37.5 |
| 110.5 | 36.1 |
| 124.0 | 32.9 |
| 138.0 | 31.6 |
| 180.0 | 30.3 |
| | 25.7 |

$C_{11}H_{12}O_2$, Ethyl cinnamate (I, II) (18, 39, 89)

| $t$, °C | $\gamma_1$ (air) | $\gamma_2$ (air) |
|---|---|---|
| 7 | 39.87 | |
| 15 | 38.93 | |
| 20 | 38.37 | |
| 25 | 37.80 | 37.10 |
| 30 | 37.25 | 36.61 |
| 41 | 36.09 | 35.52 |
| 50 | | 34.68 |
| 100 | | 29.82 |

$C_{11}H_{12}O_3$, Ethyl β-hydroxy-α-phenylacrylate (I) (92)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 37.3 | 36.0 |
| 68.9 | 32.3 |
| 118.9 | 27.4 |

$C_{11}H_{14}O_2$, Ethyl hydrocinnamate (II) (18)

At 21.5°C, $\gamma$ (air) = 35.08 ± 0.3

$C_{11}H_{16}$, Pentamethylbenzene (I) (13)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 108.1 | 24.65 |
| 207.4 | 16.32 |

**$C_{11}H_{18}O_4$, Diethyl caronate** (Ethyl *trans*-3, 3-dimethylcyclopropane-1, 2-dicarboxylate) (III) (82.7)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 12 | 31.56 |
| 54 | 27.10 |
| 75 | 25.00 |
| 93.5 | 23.15 |

**$C_{11}H_{18}O_6$, Diethyl *O*-propionylmalate** (I) $k_E$ = 2.9 (29)

| $t$, °C | $\gamma$ ±0.3 |
|---|---|
| 56.2 | 28.86 |
| 107.4 | 23.97 |
| 149.0 | 20.46 |

**$C_{11}H_{20}$, *n*-Nonylacetylene** (I) $k_E$ = 2.5 (90)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 20.3 | 28.47 |
| 36.6 | 26.90 |
| 55.6 | 25.10 |
| 75.8 | 23.29 |
| 92.5 | 21.82 |

**$C_{11}H_{20}O_2$, Undecylenic acid** (II) (23)

At 25°C, $\gamma$ (air) = 30.64 ± 0.3

**$C_{11}H_{20}O_3$, Ethyl isoamylacetoacetate** (I) (92)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 35.6 | 26.8 |
| 97.5 | 21.6 |
| 139.0 | 18.1 |

**$C_{11}H_{22}O_2$, Ethyl *n*-nonylate** (II) (20)

At 20°C, $\gamma$ (air) = 28.04 ± 0.2

**$C_{12}H_{10}$, Acenaphthene** (I) (13)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 128.6 | 32.3 |
| 178.7 | 27.4 |

**$C_{12}H_{10}$, Diphenyl** (I) (13)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 129.2 | 29.5 |
| 179.7 | 24.8 |

**$C_{12}H_{10}N_2O$, Azoxybenzene** (III) (82)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 51 | 43.34 |
| 66.5 | 41.42 |
| 77.5 | 40.26 |
| 89 | 39.17 |

**$C_{12}H_{11}N$, Diphenylamine** (I, III) (14, 30, 56, 83)

| $t$, °C | $\gamma$ (air or vapor) ±1.0 |
|---|---|
| 80 | 37.7 |
| 150 | 30.7 |
| 200 | 26.0 |
| 275 | 19.8 |

**$C_{12}H_{14}O_4$, Diethyl phthalate** (I, II) (18, 44, 89)

| $t$, °C | $\gamma$ (air) | $k_E$ |
|---|---|---|
| 10 | 38.5±0.3 | |
| 20 | 37.5±0.2 | 3.1 |

**$C_{12}H_{14}O_4$.—(*Continued*)**

| $t$, °C | $\gamma$ (air) | $k_E$ |
|---|---|---|
| 50 | 34.5±0.3 | |
| 75 | 32.0±0.3 | |
| 94 | 30.1±0.4 | 2.6 |

**$C_{12}H_{14}O_4$, *dl*-Ethyl benzoyllactate** (I, II) $k_E$ = 3.0 (29, 44)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 15 | 37.5 |
| 20 | 36.9 |
| 60 | 32.8 |
| 110 | 27.6 |

**$C_{12}H_{16}O_2$, *n*-Propyl hydrocinnamate** (I) $k_E$ = 2.8 (89)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 19.0 | 34.50 |
| 31.7 | 33.15 |
| 47.9 | 31.52 |
| 62.1 | 30.05 |
| 80.5 | 28.31 |

**$C_{12}H_{16}O_2$, Isopropyl hydrocinnamate** (I) $k_E$ = 2.7 (89)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 18.5 | 33.27 |
| 42.0 | 30.96 |
| 51.7 | 30.00 |
| 71.7 | 28.07 |
| 100.6 | 25.27 |

**$C_{12}H_{18}O_6$, Triethyl aconitate** (I) $k_E$ = 3.2 (90)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 20.3 | 34.55 |
| 34.8 | 33.04 |
| 51.0 | 31.36 |
| 69.7 | 29.47 |
| 90.6 | 27.43 |

**$C_{12}H_{20}O_6$, *l*-Diethyl *O*-*n*-butyrylmalate** (I, II) $k_E$ = 3.3 (29, 44)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 0 | 33.9 |
| 20 | 31.8 |
| 50 | 28.9 |
| 100 | 24.1 |
| 145 | 20.1 |

**$C_{12}H_{22}O_2$, Ethyl α-dihydrocampholenate** (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −21 | 31.0 |
| +95 | 21.5 |
| 194 | 13.5 |

**$C_{12}H_{27}N$, Triisobutylamine** (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −21 | 24.5 |
| +90.3 | 18.0 |
| 185 | 11.0 |

**$C_{13}H_6Cl_4O$, 3, 4, 3′, 4′-Tetrachlorobenzophenone** (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 154 | 35.1 |
| 186.5 | 32.1 |
| 220 | 29.3 |

**$C_{13}H_6Cl_6$, 2, 4, 2′, 4′-Tetrachlorobenzophenone dichloride** (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 156 | 31.2 |
| 185.5 | 29.9 |
| 218 | 27.9 |

**$C_{13}H_{10}O$, Benzophenone** (I, II) $k_E$ = 2.9 (13, 50, 89)

| $t$, °C | $\gamma$ (air or vapor) ±0.4 |
|---|---|
| 10 | 46.2 |
| 20 | 45.1 |
| 50 | 41.8 |
| 90 | 37.4 |

**$C_{13}H_{10}O_3$, Diphenyl carbonate** (III) (82)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 101 | 34.28 |
| 120.5 | 32.19 |
| 139 | 30.41 |

**$C_{13}H_{10}O_3$, Phenyl salicylate** (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 0 | 45.7 |
| 90.1 | 36.8 |
| 211.6 | 26.3 |

**$C_{13}H_{12}$, Diphenylmethane** (I, II) (13, 24, 40)

| $t$, °C | $\gamma$ (air) |
|---|---|
| 30 | 37.1±0.5 |
| 60 | 34.9±0.5 |
| 210 | 24 ±2.0 |

**$C_{13}H_{12}O$, Benzohydrol** (I) $k_E$ = 2.2 (28)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 73.55 | 38.65 |
| 90.9 | 37.06 |

**$C_{13}H_{14}O_2$, Isobutyl phenylpropiolate** (I) $k_E$ = 2.3 (89)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 16.7 | 35.34 |
| 34.6 | 33.71 |
| 62.0 | 31.23 |
| 93.0 | 28.39 |

**$C_{13}H_{16}O$, Benzalpinacolin** (I) $k_E$ = 2.6 (16)

| $t$, °C | $\gamma$ (air) ±*ca.* 1.5 |
|---|---|
| 62.0 | 32.8 |
| 83.0 | 30.9 |
| 110.3 | 28.6 |
| 137.1 | 26.0 |
| 156.0 | 24.5 |
| 199.0 | 20.6 |

**$C_{13}H_{22}O_6$, *l*-Diethyl *O*-*n*-valerylmalate** (I) $k_E$ = 3.5 (29)

| $t$, °C | $\gamma$ ±0.3 |
|---|---|
| 16.3 | 31.51 |
| 54.7 | 27.52 |
| 107.4 | 23.20 |
| 147.8 | 19.93 |

For notes †–§§ *see* p. 475.

**$C_{13}H_{24}O_4$, Di-*act*.-amyl malonate** (I, II) $k_E$ = 2.8 (44, 89)

| $t$, °C | $\gamma$ (air)‡ |
|---|---|
| 25 | 27.9±0.7 |
| 60 | 25.1±0.6 |
| 100 | 21.9±0.5 |

**$C_{14}H_{10}O_2$, Benzil** (III) $\gamma$ (air) (96)

**$C_{14}H_{12}O_2$, Benzyl benzoate** (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 21.8 | 47.4 |
| 90.8 | 35.8 |
| 210.5 | 26.6 |

**$C_{14}H_{14}$, *sym*.-Diphenylethane** (I) (13)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 108.3 | 29.09 |
| 210.2 | 19.95 |

**$C_{14}H_{14}$, 1, 1-Diphenylethane** (II) (24)

| $t$, °C | $\gamma$ (air) ±0.5 |
|---|---|
| 20 | 37.67 |
| 25 | 37.20 |

**$C_{14}H_{14}N_2O$, *o*, *o*′-Azoxytoluene** (III) (82)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 69.5 | 40.41 |
| 78.5 | 39.39 |
| 90.5 | 38.33 |
| 101 | 37.25 |

**$C_{14}H_{14}N_2O_3$, *p*, *p*′-Azoxyanisole**

(I) (67)

| $t$, °C | $\gamma$ |
|---|---|
| 116.3 | 38.62 |
| 133.3 | 37.27 |
| 135.1 | 37.01 |
| 153.3 | 35.60 |

(III) (30)

| $t$, °C | $\gamma$ ($N_2$)† |
|---|---|
| 115 | 40.1 |
| 160.5 | 35.5 |
| 211 | 31.4 |

**$C_{14}H_{15}N$, Dibenzylamine** (I) $k_E$ = 2.9 (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 20 | 41.1 |
| 30 | 40.0 |
| 45 | 38.4 |
| 60 | 36.8 |
| 75 | 35.1 |

**$C_{14}H_{20}O_2$, Amyl hydrocinnamate** (II) (43)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 15 | 32.45 |
| 40 | 30.30 |

**$C_{14}H_{20}O_2$, *act*.-Amyl hydrocinnamate** (I) $k_E$ = 2.8 (89)

| $t$, °C | $\gamma$ (air) ±0.3‡ |
|---|---|
| 16.0 | 33.20 |
| 38.4 | 31.13 |
| 57.0 | 29.43 |
| 83.8 | 27.05 |
| 99.8 | 25.64 |

$C_{14}H_{23}ClO_4$, Di-*act.*-amyl chlorofumarate (I, II) $k_E = 2.9$ (44, 89)

| $t$, °C | $\gamma$ (air)‡ |
|---|---|
| 30 | 29.6±0.6 |
| 60 | 27.2±0.5 |
| 100 | 24.0±0.5 |

$C_{14}H_{23}N$, Diisobutylaniline (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 0 | 32.8 |
| 92.5 | 23.9 |
| 195.8 | 15.9 |

$C_{14}H_{24}O_4$, Di-*act.*-amyl maleate (I) $k_E = 2.8$ (89)

| $t$, °C | $\gamma$ (air) ±0.3‡ |
|---|---|
| 17.4 | 29.59 |
| 28.7 | 28.62 |
| 42.8 | 27.47 |
| 61.2 | 25.97 |
| 73.2 | 25.01 |
| 96.8 | 22.62 |

$C_{14}H_{24}O_6$, *l*-Diethyl *O*-caproylmalate (I) $k_E = 3.1$ (29, 62)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 10 | 31.8 |
| 20 | 30.9 |
| 50 | 28.3 |
| 100 | 24.0 |
| 145 | 20.1 |

$C_{14}H_{26}O_4$, Di-*act.*-amyl succinate (I, II) $k_E = 2.9$ (44, 89)

| $t$, °C | $\gamma$ (air) ±0.7‡ |
|---|---|
| 20 | 28.9 |
| 50 | 26.5 |
| 100 | 22.6 |

$C_{14}H_{26}O_4$, Diethyl sebacate (I) $k_E = 3.3$ (90)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 22.5 | 32.94 |
| 38.7 | 31.30 |
| 55.8 | 29.65 |
| 75.0 | 27.84 |
| 97.6 | 25.78 |

$C_{14}H_{26}O_5$, Diamyl malate (II) (44)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 30 | 27.96 |
| 40 | 27.28 |
| 60 | 25.95 |

$C_{15}H_{16}$, 1, 1-Diphenylpropane (II) (24)

| $t$, °C | $\gamma$ (air) ±0.5 |
|---|---|
| 20 | 37.15 |
| 25 | 36.64 |

$C_{15}H_{16}$, Di-*p*-tolylmethane (II) (24)

| $t$, °C | $\gamma$ (air) ±0.5 |
|---|---|
| 20 | 35.51 |
| 25 | 34.80 |

$C_{15}H_{22}O_8$, Tetraethyl cyclopropane -1, 1, 2, 2-tetracarboxylate (III) (82.7)

$C_{15}H_{22}O_8$.—(*Continued*)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 76 | 29.08 |
| 97 | 27.08 |
| 122 | 24.75 |
| 152 | 21.93 |

$C_{15}H_{26}O_4$, Di-*act.*-amyl citraconate (I) $k_E = 2.9$ (89)

| $t$, °C | $\gamma$ (air) ±0.3‡ |
|---|---|
| 24.8 | 28.78 |
| 46.5 | 26.91 |
| 66.6 | 25.29 |
| 82.6 | 24.00 |
| 99.9 | 22.65 |

$C_{15}H_{26}O_4$, Di-*act.*-amyl mesaconate (I) $k_E = 2.9$ (89)

| $t$, °C | $\gamma$ (air) ±0.3‡ |
|---|---|
| 27.4 | 29.16 |
| 42.0 | 27.96 |
| 60.1 | 26.45 |
| 74.5 | 25.26 |
| 101.1 | 23.16 |

$C_{15}H_{26}O_6$, Tributyrin (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| −20.5 | 33.0 |
| +99.8 | 25.5 |
| 200.8 | 18.3 |

$C_{15}H_{26}O_6$, *l*-Diethyl *O*-*n*-heptoylmalate (I, II) $k_E = 3.2$ (29, 44)

| $t$, °C | $\gamma$ (air or vapor) ±0.3 |
|---|---|
| 0 | 32.6 |
| 20 | 30.9 |
| 60 | 27.4 |
| 145 | 20.0 |

$C_{15}H_{33}N$, Triisoamylamine (I) $k_E = 3.2$ (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 20 | 24.5 |
| 30 | 23.6 |
| 45 | 22.3 |
| 60 | 21.1 |
| 75 | 19.8 |

$C_{16}H_{14}O_4$, *o*, *o*-Dimethoxybenzil (III) $\gamma$ (air) (96)

$C_{16}H_{16}NO_2$, Anisaldazine (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 171 | 32.1 |
| 180.5 | 31.2 |
| 230.5 | 26.8 |

$C_{16}H_{18}N_2O_3$, *p*-Azoxyphenetole (I) (67)

| $t$, °C | $\gamma$ |
|---|---|
| 134.9 | 30.77 |
| 165.1 | 28.44 |
| 169.4 | 28.06 |
| 183.8 | 27.01 |

(III) (30)

| $t$, °C | $\gamma$ ($N_2$)† |
|---|---|
| 142.5 | 31.6 |
| 174.5 | 28.6 |
| 219 | 25.2 |

$C_{16}H_{22}O_4$, Diethyl ethylbenzylmalonate (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 0 | 39.0 |
| 106 | 28.1 |
| 206.5 | 19.7 |

$C_{16}H_{28}O_6$, *l*-Diethyl *O*-*n*-octoylmalate (I, II) $k_E = 3.2$ (29, 44)

| $t$, °C | $\gamma$ (air or vapor) |
|---|---|
| 0 | 32.5±0.2 |
| 20 | 30.7±0.2 |
| 50 | 28.1±0.3 |
| 100 | 23.8±0.3 |
| 145 | 20.3±0.3 |

$C_{16}H_{34}N_2S$, Triisoamylammonium thiocyanate (I) $k_E = 1.5$ (88)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 80 | 30.31 |
| 100 | 29.39 |
| 122 | 28.42 |

$C_{17}H_{14}O_3$, Dibenzoylacetone (I) (69)

| $t$, °C | $\gamma$ ±*ca.* 2.0 |
|---|---|
| 109.5 | 35.3 |
| 169.7 | 30.1 |

$C_{17}H_{30}O_6$, *l*-Diethyl *O*-*n*-nonoylmalate (I, II) $k_E = 3.9$ (29, 44)

| $t$, °C | $\gamma$ (air or vapor) |
|---|---|
| 0 | 32.5±0.4 |
| 20 | 30.8±0.3 |
| 50 | 28.1±0.3 |
| 100 | 23.8±0.3 |
| 145 | 20.3±0.3 |

$C_{18}H_{15}O_4P$, Triphenyl phosphate (III) (82)

| $t$, °C | $\gamma$ (air) ±1§§ |
|---|---|
| 65.5 | 40.63 |
| 74 | 39.64 |
| 84 | 38.71 |

$C_{18}H_{15}P$, Triphenylphosphine (I) $k_E = 3.3$ (89)

| $t$, °C | $\gamma$ (air) ±0.4 |
|---|---|
| 45.7 | 42.04 |
| 68.8 | 39.74 |
| 95.9 | 36.94 |
| 107.1 | 35.80 |

$C_{18}H_{15}Sb$, Triphenylstibine (I) $k_E = 2.9$ at 35°C; 3.6 at 100°C (89)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 35.1 | 43.01 |
| 63.1 | 40.37 |
| 91.2 | 37.32 |
| 103.0 | 36.08 |

$C_{18}H_{18}N_2O_5$, Ethyl *p*-azoxybenzoate (III) (30)

| $t$, °C | $\gamma$ ($N_2$) ±2† |
|---|---|
| 114 | 27.0 |
| 140 | 26.2 |
| 230 | 25.3 |

For notes †–§§ *see* p. 475.

$C_{18}H_{26}O_4$, Di-*act.*-amyl phthalate (I, II) (44, 89)

| $t$, °C | $\gamma$ (air) ±0.7‡ | $k_E$ |
|---|---|---|
| 20 | 31.5 | 3.3 |
| 60 | 28.6 | |
| 105 | 25.2 | 2.5 |

$C_{18}H_{32}O_6$, *l*-Diethyl *O*-*n*-decoylmalate (I, II) $k_E = 3.7$ (29, 44)

| $t$, °C | $\gamma$ (air or vapor) |
|---|---|
| 0 | 32.8±0.4 |
| 20 | 31.0±0.4 |
| 50 | 28.3±0.3 |
| 100 | 23.0±0.3 |
| 145 | 20.5±0.3 |

$C_{18}H_{34}O_2$, Oleic acid (II) (18, 20)

At 20°C, $\gamma$ (air) = 32.50 ± 0.3

$C_{18}H_{34}O_3$, Ricinoleic acid (II) (18)

At 16°C, $\gamma$ (air) = 35.81 ± 0.3

$C_{19}H_{16}$, Triphenylmethane (I) (56)

At 125°C, $k_E = 2.1$; at 300°C, $k_E = 1.5$

| $t$, °C | $\gamma$ ±*ca.* 1 |
|---|---|
| 108.7 | 33.8 |
| 130.5 | 31.4 |
| 154.0 | 28.8 |
| 208.2 | 24.5 |
| 229.6 | 23.0 |
| 278.7 | 19.2 |
| 335.5 | 15.4 |

$C_{19}H_{16}O$, Triphenyl carbinol (I) $k_E = 2.2$ (28)

| $t$, °C | $\gamma$ ±0.4 |
|---|---|
| 165.8 | 30.38 |
| 190.5 | 28.67 |

$C_{20}H_{38}O_4$, Diisoamyl sebacate (I) $k_E = 3.4$ (90)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 23.5 | 30.86 |
| 35.9 | 29.83 |
| 52.0 | 28.50 |
| 64.8 | 27.50 |
| 80.5 | 26.23 |
| 95.1 | 25.08 |

$C_{20}H_{44}IN$, Tetraisoamylammonium iodide (I) $k_E = 1.8$ (88)

| $t$, °C | $\gamma$ (air) ±0.3 |
|---|---|
| 99.5 | 27.27 |
| 109.5 | 26.84 |
| 119.0 | 26.39 |
| 130.5 | 25.88 |

$C_{21}H_{21}N$, Tribenzylamine (I) $k_E = 3.6$ (83)

| $t$, °C | $\gamma$ (?) ±0.5 |
|---|---|
| 95 | 33.7 |
| 105 | 32.8 |
| 120 | 31.3 |
| 135 | 29.8 |

$C_{21}H_{23}NO_3$, Ethyl *p*-ethoxybenzalamino-α-methylcinnamate (III) (30)

| *t*, °C | γ ($N_2$) ±2† |
|---|---|
| 85 | 28.7 |
| 123.7 | 28.3 |
| 179 | 27.7 |

$C_{21}H_{38}O_6$, Tricaproin (III) (30)

| *t*, °C | γ ($N_2$) ±2† |
|---|---|
| −20 | 33.4 |
| +99.8 | 25.3 |
| 200 | 19.6 |

$C_{22}H_{42}O_3$, Isobutyl ricinoleate (I) $k_E$ = 3.4 (87)

| *t*, °C | γ (air) ±0.3 |
|---|---|
| 23 | 31.30 |
| 55.5 | 28.81 |
| 85.3 | 26.49 |

$C_{23}H_{46}O_2$, *act.*-Amyl stearate (I, II) $k_E$ = 3.5 (29, 44)

| *t*, °C | γ (air or vapor) ±0.3‡ |
|---|---|
| 30 | 29.1 |
| 50 | 27.6 |
| 100 | 24.0 |
| 150 | 20.4 |

$C_{26}H_{54}$, *n*-Hexacosane (I) $k_E$ = 3.9 (70)

| *t*, °C | γ‡‡ |
|---|---|
| 91.7 | 24.8 |
| 121.8 | 22.5 |
| 158.3 | 19.9 |

$C_{27}H_{50}O_6$, Tricaprylin (III) (30)

| *t*, °C | γ ($N_2$) ±2† |
|---|---|
| 0 | 30.1 |
| 99.8 | 25.1 |
| 200.2 | 19.7 |

$C_{30}H_{62}O$, Myricyl alcohol (I) $k_E$ = 4.2 (70)

| *t*, °C | γ‡‡ |
|---|---|
| 95.3 | 26.2 |
| 131.3 | 23.4 |
| 158.2 | 21.6 |

$C_{33}H_{62}O_6$, Tricaprin (III) (30)

| *t*, °C | γ ($N_2$) ±2† |
|---|---|
| 35.4 | 27.6 |
| 121 | 23.0 |
| 201.2 | 18.8 |

$C_{34}H_{50}O_2$, Cholesteryl benzoate (I) (67)

| *t*, °C | γ‡‡ |
|---|---|
| 147.4 | 23.8 |
| 177.2 | 22.9 |
| 181.4 | 22.9 |
| 210.2 | 21.8 |

$C_{39}H_{74}O_6$, Trilaurin (III) (30)

| *t*, °C | γ ($N_2$) ±2† |
|---|---|
| 64.7 | 29.2 |
| 139 | 25.1 |
| 200 | 22.1 |

$C_{51}H_{98}O_6$, Tripalmitin (I) $k_E$ = 5.4 (87)

| *t*, °C | γ (air) ±0.3 |
|---|---|
| 55.7 | 29.47 |
| 65.9 | 28.78 |
| 76.9 | 27.98 |
| 87.6 | 27.19 |
| 96.7 | 26.56 |
| 115.3 | 25.32 |

$C_{57}H_{104}O_6$, Triolein (III) (30)

| *t*, °C | γ ($N_2$) ±2† |
|---|---|
| 17 | 40.1 |
| 99.8 | 29.3 |
| 200.6 | 25.0 |

$C_{57}H_{110}O_6$, Tristearin (I) $k_E$ = 5.5 (87, 92)

| *t*, °C | γ (air or vapor) |
|---|---|
| 60 | 29.6 |
| 100 | 26.8 |
| 130 | 24.7 |

$C_{60}H_{122}$, *n*-Hexacontane (I) $k_E$ = 5.5 (70)

| *t*, °C | γ‡‡ |
|---|---|
| 115.4 | 24.2 |
| 159.9 | 21.6 |
| 190.6 | 19.8 |

For notes †–§§ *see* p. 475.

## LITERATURE

(For a key to the periodicals see end of volume)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## SURFACE TENSION OF SOLUTIONS

ABBREVIATIONS AND SYMBOLS; *v. further* p. 433

M = Moles per kg solvent.
$M/l_s$ = Moles per liter solution.
$g/l_s$ = grams per liter solution.
$x_A$ = Mole fraction of A.

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The values for *pure liquids* which appear in the tables of this section are not the best values but are those obtained with the liquid actually used in preparing the solutions (corrected, however, for obvious errors, such as the use of too small a tube for the larger tube in the capillary-height method). The use of these values is necessary in order to give the best values of Δγ and the proper shape to the γ-composition curves.

*See* p. 474, 475 for effect of various inorganic gases and p. 475 for effect of organic vapors on the surface tension at the interface, liquid—gas.

### Aqueous Solutions, One Solute

𝔅-TABLE,* STANDARD ARRANGEMENT (*v.* Vol. III, p. viii)

* Very dilute aqueous salt solutions have been studied by Gradenwitz (15, 22) and Kleine (22, 25). The results of these workers indicate that $d\gamma/dM$ decreases as M increases. The value of Δγ found by them for relatively large values of M do not agree well with reliable modern determinations. Therefore, their results are not reproduced in these tables. Until their work is repeated the shape of the Δγ-M curves in dilute solutions (M < 0.2) will remain uncertain.

$H_2O_2$ (I) (32)

| Wt. % | $\gamma$ (air) $\pm ca.$ 0.3 |
|---|---|
| 0°C | |
| 0.00 | 75.64 |
| 12.54 | 76.06 |
| 27.22 | 76.41 |
| 34.58 | 76.70 |
| 56.06 | 77.46 |
| 86.31 | 78.46 |
| 18°C | |
| 0.00 | 72.97 |
| 12.78 | 73.37 |
| 28.14 | 73.82 |
| 44.31 | 74.28 |
| 60.83 | 74.88 |
| 90.66 | 75.82 |

HCl, 20°C (I, II) (44, 51, 61)

| M | $\Delta\gamma$ (air) |
|---|---|
| 0.5 | $-0.16 \pm 0.1$ |
| 1.0* | $-0.28 \pm 0.1$ |
| 2.0 | $-0.48 \pm 0.2$ |
| 4.0 | $-0.85 \pm 0.3$ |
| 6.0 | $-1.25 \pm 0.3$ |
| 9.0 | $-2.2 \pm 0.3$ |
| 17.7 | $-6.8 \pm 1.5$ |

* 0° and 30°C for M = 1 (33).

HBr, 18°C (I) (51)

| M | $\Delta\gamma$ (air) $\pm 0.2$ |
|---|---|
| 0.699 | −0.38 |
| 1.497 | −0.69 |

$H_2SO_4$, values of $\gamma$ (air or vapor) (I, II) (34, 51); *v.* Fig. 2

98.5% (I, II) (1, 34, 51)

| $t$, °C | $\gamma$ (air or vapor) |
|---|---|
| 10 | $55.5 \pm 0.5$ |
| 20 | $55.1 \pm 0.5$ |
| 100 | $52.5 \pm 1.0$ |
| 150 | $51 \pm 2.0$ |
| 200 | $49 \pm 2.0$ |
| 250 | $46 \pm 2.0$ |

$HNO_3$, 15–20°C (I, III) (44, 51, 64)

| M | $\Delta\gamma$ (air) |
|---|---|
| 0.7 | $-0.6 \pm 0.2$ |
| 1.5 | $-1.1 \pm 0.2$ |
| 2.8 | $-1.8 \pm 0.5$ |
| 8.5 | $-4.4 \pm 1.0$ |

99.8% (I) (1)

| $t$, °C | $\gamma \pm ca.$ 2.0 |
|---|---|
| 11.6 | 42.7 |
| 46.2 | 37.2 |
| 78.2 | 32.6 |

$NH_4OH$, 18°C (I, V) (7, 51, 55, 70)

| M | $\Delta\gamma$ (air) |
|---|---|
| 0.5 | $-1.35 \pm 0.3$ |
| 1.0 | $-2.35 \pm 0.3$ |
| 1.5 | $-3.1 \pm 0.3$ |
| 3.0 | $-5.2 \pm 0.3$ |
| 6.0 | $-7.8 \pm 0.4$ |
| 10.0 | $-10.1 \pm 0.5$ |
| 15.0 | $-12.0 \pm 0.5$ |
| 20.0 | $-13.4 \pm 0.5$ |
| 23.0 | $-14.0 \pm 0.5$ |
| 34.0 | $-16.0 \pm 0.5$ |

$NH_4NO_3$, 20 and 100°C (I, II, III, IX) (12, 33, 48, 51, 54)

| M | $\Delta\gamma$ (air) |
|---|---|
| 0.5 | $0.5 \pm 0.1$ |
| 1.0 | $1.0 \pm 0.1$ |
| 2.0 | $1.9 \pm 0.1$ |
| 3.0 | $2.77 \pm 0.15$ |
| 4.0 | $3.58 \pm 0.15$ |
| 5.0 | $4.34 \pm 0.2$ |
| 6.0 | $5.07 \pm 0.2$ |
| 8.0 | $6.40 \pm 0.2$ |
| 10.0 | $7.55 \pm 0.2$ |
| 12.0 | $8.57 \pm 0.2$ |
| 14.0 | $9.37 \pm 0.2$ |

$NH_4Cl$ (I, II, III, IX) (12, 14, 25, 33, 51, 54, 61)

| | |
|---|---|
| 0°C | |
| 1.0 | $1.39 \pm 0.3$ |
| 20°C | |
| 0.025 | $0.05 \pm 0.03$ |
| 0.1 | $0.155 \pm 0.03$ |
| 0.25 | $0.355 \pm 0.03$ |
| 0.5 | $0.71 \pm 0.05$ |
| 1.0 | $1.39 \pm 0.10$ |
| 10, 20 and 30°C | |
| 2.0 | $2.6 \pm 0.2$ |
| 3.0 | $3.7 \pm 0.2$ |
| 4.0 | $4.8 \pm 0.2$ |
| 5.0 | $5.8 \pm 0.2$ |
| 6.0 | $6.9 \pm 0.2$ |
| 6.7 | $7.6 \pm 0.2$ |

$NH_4Br$, 15–20°C (I) (51, 59)

| | |
|---|---|
| 0.7 | $0.94 \pm 0$ 1 |
| 1.5 | $1.9 \pm 0.1$ |
| 2.25 | $2.7 \pm 0.2$ |

$NH_4I$, 18°C (I) (51)

| | |
|---|---|
| 0.7 | $0.52 \pm 0.2$ |
| 1.5 | $1.11 \pm 0.2$ |

$(NH_4)_2SO_4$, 10–20°C (I, III, IX) (12, 51, 54)

| | |
|---|---|
| 0.5 | $1.09 \pm 0.1$ |
| 1.0 | $2.17 \pm 0.2$ |
| 2.0 | $4.35 \pm 0.3$ |
| 3.0 | $6.50 \pm 0.3$ |
| 4.0 | $8.67 \pm 0.3$ |
| 4.8 | $10.38 \pm 0.3$ |

$H_3PO_4$ (33)

$(NH_4)_2HPO_4$ (54)

$Pb(NO_3)_2$, 15°C (III, IX) (12, 54)

| | |
|---|---|
| 0.5 | $0.90 \pm 0.2$ |
| 1.1 | $2.00 \pm 0.3$ |

$Pb(C_2H_3O_2)_2$, Acetate (38)

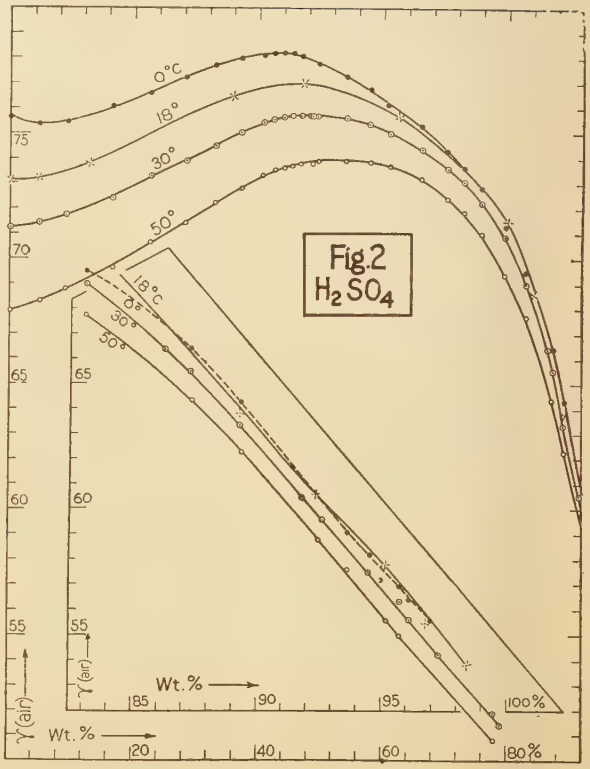
ThOH (10)

$ZnCl_2$, 12.5°C (IX) (54)

| | |
|---|---|
| 0.530 | $1.47 \pm 0.4$ |

$ZnSO_4$ (I, III, IX) 10–30°C (12, 43, 54, 61)

| | |
|---|---|
| 0.25 | $0.5 \pm 0.05$ |
| 0.5 | $0.98 \pm 0.1$ |
| 1.0 | $1.96 \pm 0.15$ |
| 2.0 | $4.3 \pm 0.2$ |
| 2.4 | $5.3 \pm 0.2$ |




$ZnSO_4$.—(*Continued*)

| M | $\Delta\gamma$ (air) |
|---|---|
| 2.75 | $6.3 \pm 0.2$ |
| 5.25 | $11.7 \pm ?$ |

$Zn(NO_3)_2$, 21°C (IX) (54)

| | |
|---|---|
| 2.31 | $4.85 \pm 1.0$ |
| 40°C (II) (41) | |
| 0.6 | $1.5 \pm ca.$ 0.3 |
| 1.1 | $3.0 \pm ca.$ 0.5 |
| 2.8 | $7.8 \pm ca.$ 1.0 |
| 4.2 | $11.5 \pm ca.$ 1.5 |
| 5.2 | $13.7 \pm ca.$ 1.5 |
| 6.3 | $15.3 \pm ca.$ 2.0 |

$Zn(C_2H_3O_2)_2$, Acetate (38)

$CdCl_2$, 20°C (II) (13, 33)

| | |
|---|---|
| 0.5 | $0.9 \pm 0.1$ |
| 1.0 | $1.7 \pm 0.2$ |
| 2.5 | $4.1 \pm 0.3$ |
| 4.0 | $6.4 \pm 0.3$ |
| 5.8 | $8.8 \pm 0.4$ |

$CdSO_4$, 15°C (I) (59)

| | |
|---|---|
| 0.355 | $0.96 \pm 0.5$ |
| 0.710 | $1.37 \pm 0.5$ |

$Hg(CN)_2$ (V, IX) (54, 55)

For 0.25 M, $\Delta\gamma$ (air) from 15 to 20°C = $-0.28 \pm 0.15$

$CuCl_2$ (54)

$CuSO_4$, 10–30°C (I, III, IX) (12, 43, 44, 54, 61)

| M | $\Delta\gamma$ (air) |
|---|---|
| 0.2 | $0.37 \pm 0.05$ |
| 0.5 | $0.92 \pm 0.1$ |
| 1.0 | $1.83 \pm 0.1$ |
| 1.2 | $2.20 \pm 0.1$ |

$Cu(CHO_2)_2$, Formate (38)

$AgNO_3$ (II, III, IX) (13, 48, 54)

| | $\Delta\gamma$ (air) | |
|---|---|---|
| M | 20°C | 100°C |
| 0.5 | $0.64 \pm 0.1$ | |
| 1.0 | $1.23 \pm 0.2$ | $1.3 \pm 0.2$ |
| 2.0 | $2.31 \pm 0.3$ | |
| 3.0 | $3.28 \pm 0.4$ | $3.8 \pm 0.4$ |
| 5.0 | $4.95 \pm 0.3$ | $5.9 \pm 0.4$ |
| 6.2 | $5.85 \pm 0.2$ | $7.2 \pm 0.5$ |

$MnCl_2$, 18°C (I, IX) (44, 54)

| M | $\Delta\gamma$ (air) |
|---|---|
| 0.5 | $1.49 \pm 0.2$ |
| 1.0 | $2.97 \pm 0.2$ |
| 2.0 | $5.92 \pm 0.2$ |
| 3.0 | $8.90 \pm 0.3$ |
| 4.0 | $11.84 \pm 0.3$ |
| 4.8 | $14.20 \pm 0.4$ |

$MnSO_4$, 15–18°C (I, III, IX) (54, 59, 64)

| | |
|---|---|
| 0.5 | $1.05 \pm 0.3$ |
| 1.0 | $2.1 \pm 0.5$ |

**$Mn(C_3H_5O_3)_2$, Lactate [38]**

**$FeCl_3$, 15–20°C (I) [44]**

| M | $\Delta\gamma$ (air) |
|---|---|
| 3.30 | 6.6±0.5 |
| 5.24 | 12.0±0.5 |

**$FeSO_4$, 20°C (III, IX) [12, 54]**

| | |
|---|---|
| 0.5 | 0.75±0.2 |
| 1.0 | 1.55±0.4 |
| 1.5 | 2.30±0.5 |

**$Fe_2(C_2O_4)_3$, Oxalate [38]**

**$CoSO_4$, 15°C (I) [59]**

| | |
|---|---|
| 0.355 | 0.79±0.3 |
| 0.713 | 1.56±0.3 |

**$NiSO_4$, 15°C (I) [59]**

| | |
|---|---|
| 0.354 | 0.80±0.3 |
| 0.707 | 1.54±0.3 |

**$Al_2(SO_4)_3$ (IX) [54]**

M = 0.561

| $t$, °C | $\Delta\gamma$ (air) |
|---|---|
| 20.5 | 1.91±0.4 |
| 16.25 | 1.86±0.4 |

**$MgCl_2$ (I, IX) [14, 25, 54, 61]**

| M | $\Delta\gamma$ (air) |
|---|---|
| 20°C | |
| 0.025 | 0.09±0.02 |
| 0.05 | 0.17±0.02 |
| 0.1 | 0.32±0.03 |
| 0.25 | 0.78±0.04 |
| 0.5 | 1.52±0.05 |
| 1.0 | 3.04±0.1 |
| 2.0 | 6.35±0.3 |
| 3.0 | 10.23±0.5 |
| 3.65 | 12.95±0.5 |
| 10 and 30°C | |
| 1.0 | 3.04±0.2 |
| 2.0 | 6.35±0.3 |
| 3.0 | 10.23±0.5 |

**$MgSO_4$ (I, II, III, IX) [12, 25, 43, 54, 61]; *cf.* [33]**

| | |
|---|---|
| 10°C | |
| 1.0 | 2.10±0.1 |
| 2.0 | 4.57±0.1 |
| 20°C | |
| 0.025 | 0.08±0.03 |
| 0.05 | 0.15±0.05 |
| 0.1 | 0.26±0.06 |
| 0.25 | 0.53±0.05 |
| 0.5 | 1.03±0.05 |
| 1.0 | 2.10±0.1 |
| 2.0 | 4.57±0.1 |
| 2.7 | 6.52±0.2 |
| 30°C | |
| 1.0 | 2.10±0.1 |
| 2.0 | 4.57±0.1 |
| 4.2 | (8.1 ±3.0) |

**$Mg(CHO_2)_2$, Formate [38]**

**Mg $(C_2H_3O_2)_2$, Acetate 25°C (I) [50]; *cf.* [54]**

| | |
|---|---|
| 0.45 | 0.9±*ca.* 0.5 |
| 1.14 | 0.4±*ca.* 0.5 |
| 2.16 | +0.1±*ca.* 0.5 |
| 3.22 | −1.4±*ca.* 0.5 |
| 4.55 | −2.3±*ca.* 0.5 |

**$CaCl_2$ (I, II, IX) [14, 16, 41, 54, 61]**

| M | $\Delta\gamma$ (air) |
|---|---|
| 10°C | |
| 0.5 | 1.52±0.2 |
| 1.0 | 3.2 ±0.3 |
| 2.0 | 6.9 ±0.4 |
| 3.0 | 11.0 ±0.3 |
| 4.0 | 14.95±0.2 |
| 25°C | |
| 0.1 | 0.35±0.03 |
| 0.25 | 0.78±0.03 |
| 0.5 | 1.52±0.1 |
| 1.0 | 3.2 ±0.15 |
| 2.0 | 6.9 ±0.2 |
| 3.0 | 11.0 ±0.2 |
| 4.0 | 14.95±0.2 |
| 5.0 | 18.4 ±0.3 |
| 7.0 | 25.1 ±0.5 |
| 11.2 | 35 ±4.0 |

**$CaSO_4$ [55]**

**$Ca(CHO_2)_2$, Formate [38, 59]**

**$Ca(C_2H_3O_2)_2$, Acetate [38, 59]**

**$SrCl_2$ (I, IX) [14, 25, 54, 61]**

| | |
|---|---|
| 20°C | |
| 0.025 | 0.10±0.02 |
| 0.05 | 0.18±0.02 |
| 0.1 | 0.35±0.03 |
| 0.25 | 0.82±0.05 |
| 0.5 | 1.62±0.1 |
| 1.0 | 3.25±0.1 |
| 1.5 | 5.00±0.15 |
| 2.0 | 6.76±0.2 |
| 2.6 | 8.87±0.2 |
| 10 and 30°C | |
| 0.5 | 1.62±0.1 |
| 1.0 | 3.25±0.1 |
| 1.5 | 5.00±0.15 |

**$Sr(NO_3)_2$ 23.7°C (IX) [54]**

| | |
|---|---|
| 0.561 | 1.27±0.4 |

**$Sr(CHO_2)_2$, Formate [38]**

**$Sr(C_2H_3O_2)_2$, Acetate (IX) [54]**

At 12.6°C, $\Delta\gamma$ (air) = 0.4 ± 0.3 for 0.561M

**$Ba(OH)_2$ [10]**

**$BaCl_2$ (I, II, IX) [14, 25, 54, 61]; *cf.* [33]**

| | |
|---|---|
| 20°C | |
| 0.05 | 0.19±0.05 |
| 0.1 | 0.33±0.05 |
| 0.25 | 0.78±0.05 |
| 0.5 | 1.51±0.1 |
| 1.0 | 2.97±0.2 |
| 1.7 | 5.02±0.3 |
| 10 and 30°C | |
| 0.5 | 1.51±0.1 |
| 1.0 | 2.97±0.2 |
| 1.7 | 5.02±0.3 |

**$Ba(NO_3)_2$, 20–50°C (II, IX) [33, 54]**

| | |
|---|---|
| 0.3 | 0.6±0.2 |
| 0.5 | 1.0±0.3 |

**$Ba(CHO_2)_2$, Formate [38, 59]**

**$Ba(C_2H_3O_2)_2$, Acetate [59]**

**$Ba(C_5H_9O_2)_2$, Isovalerate [56]**

**LiOH, 18°C (I) [51]; *cf.* [10]**

| M | $\Delta\gamma$ (air) |
|---|---|
| 0.7 | 1.19±0.2 |
| 1.5 | 2.46±0.2 |

**LiCl, 20°C (I, II) [13, 20, 51]**

| | |
|---|---|
| 0.5 | 0.81±0.03 |
| 1.0 | 1.63±0.05 |
| 1.5 | 2.43±0.10 |
| 2.0 | 3.26±0.1 |
| 4.0 | 6.70±0.2 |
| 8.0 | 13.53±0.2 |
| 13.0 | 20.77±0.3 |
| 19.4 | 28.01±0.4 |

**LiBr, 18°C (I) [51]**

| | |
|---|---|
| 0.7 | 0.94±0.2 |
| 1.5 | 1.95±0.2 |

**LiI, 18°C (I) [51]**

| | |
|---|---|
| 0.7 | 0.54±0.2 |
| 1.5 | 1.17±0.2 |

**$Li_2SO_4$, 18°C (I) [51]**

| | |
|---|---|
| 0.7 | 1.82±0.2 |
| 1.5 | 4.04±0.2 |

**$LiNO_3$, 18°C (I) [51]**

| | |
|---|---|
| 0.7 | 0.89±0.2 |
| 1.5 | 1.82±0.2 |

**$LiCHO_2$ Formate [38]**

**NaOH, 18°C (I) [7, 51]; *cf.* [10]**

| | |
|---|---|
| 0.7 | 1.3±0.1 |
| 1.5 | 2.8±0.2 |
| 5.0 | 10.0±0.4 |
| 7.0 | 14.7±0.4 |
| 11.0 | 22.8±1.0 |
| 14.0 | 27.6±1.0 |

**NaCl (I, II, III, IX) [12, 13, 14, 15, 19, 33, 51, 54, 61, 64)**

| | |
|---|---|
| 0°C | |
| 0.5 | 0.82 ±0.2 |
| 1.0 | 1.64 ±0.2 |
| 2.0 | 3.28 ±0.2 |
| 3.0 | 4.90 ±0.3 |
| 20°C | |
| 0.025 | 0.055±0.02 |
| 0.05 | 0.09 ±0.02 |
| 0.1 | 0.17 ±0.02 |
| 0.25 | 0.42 ±0.03 |
| 0.5 | 0.82 ±0.05 |
| 1.0 | 1.64 ±0.05 |
| 2.0 | 3.28 ±0.1 |
| 3.0 | 4.90 ±0.1 |
| 4.0 | 6.54 ±0.15 |
| 5.0 | 8.17 ±0.2 |
| 6.0 | 9.80 ±0.2 |
| 10 and 30°C | |
| 0.5 | 0.82 ±0.1 |
| 1.0 | 1.64 ±0.1 |
| 2.0 | 3.28 ±0.15 |
| 3.0 | 4.90 ±0.2 |
| 4.0 | 6.54 ±0.2 |
| 5.0 | 8.17 ±0.2 |
| 6.0 | 9.80 ±0.2 |

**$NaClO_3$, 15°C (V, IX) [54, 55]**

| M | $\Delta\gamma$ (air) |
|---|---|
| 0.5 | 0.30±0.2 |
| 1.7 | 0.96±0.4 |

**NaBr, 20°C (I, IX) [51, 54]**

| | |
|---|---|
| 0.5 | 0.65±0.2 |
| 1.0 | 1.30±0.2 |
| 1.5 | 1.97±0.2 |
| 2.9 | 3.80±0.4 |

**NaI (I, II) [33, 51]**

| | |
|---|---|
| 0°C | |
| 1.0 | 1.01±0.3 |
| 20°C | |
| 0.7 | 0.70±0.1 |
| 1.0 | 1.01±0.2 |
| 1.5 | 1.52±0.2 |
| 30°C | |
| 1.0 | 1.01±0.2 |

**$Na_2SO_4$ (I, II, III, IX) [12, 33, 43, 44, 51, 54, 61]**

| | |
|---|---|
| 0°C | |
| 0.5 | 1.36±0.4 |
| 10°C | |
| 0.2 | 0.54±0.1 |
| 0.5 | 1.36±0.1 |
| 20°C | |
| 0.2 | 0.54±0.1 |
| 0.5 | 1.36±0.1 |
| 1.0 | 2.73±0.1 |
| 30°C | |
| 0.5 | 1.36±0.1 |
| 1.0 | 2.73±0.2 |

**$Na_2S_2O_3$, 40°C (II) [41]**

| | |
|---|---|
| 0.49 | 1.5±*ca.* 25% |
| 1.00 | 2.8±*ca.* 25% |
| 3.04 | 9.3±*ca.* 25% |
| 5.04 | 16.3±*ca.* 25% |
| 8.34 | 23.9±*ca.* 25% |
| 9.73 | 27.0±*ca.* 25% |
| 11.18 | 28.8±*ca.* 25% |

**$NaHSO_4$, 13.4°C (IX) [54]**

| | |
|---|---|
| 0.561 | 1.67±0.4 |

**$NaNO_3$, (I, II, III, IX) [12, 33, 43, 51, 61]**

| | |
|---|---|
| 0°C | |
| 1.0 | 1.2 ±0.2 |
| 10°C | |
| 0.25 | 0.30±0.05 |
| 0.5 | 0.60±0.05 |
| 1.0 | 1.20±0.1 |
| 2.0 | 2.37±0.2 |
| 3.0 | 3.50±0.2 |
| 4.0 | 4.60±0.4 |
| 5.0 | 5.63±0.6 |
| 6.0 | 6.60±0.6 |
| 20°C | |
| 0.025 | 0.04±0.02 |
| 0.05 | 0.07±0.02 |
| 0.1 | 0.12±0.03 |
| 0.25 | 0.30±0.05 |
| 0.5 | 0.60±0.05 |

**$NaNO_3$.—(*Continued*)**

| M | $\Delta\gamma$ (air) |
|---|---|
| 20 and 30°C | |
| 1.0 | 1.20±0.1 |
| 2.0 | 2.37±0.2 |
| 3.0 | 3.50±0.2 |
| 4.0 | 4.6 ±0.4 |
| 5.0 | 5.63±0.6 |
| 6.0 | 6.6 ±0.6 |
| 7.0 | 7.5 ±0.6 |
| 10.0 | 9.9 ±0.6 |
| 12.2 | 11.3 ±0.6 |

**$Na_3PO_4$, 16.5°C (III) (12)**

| | |
|---|---|
| 0.28 | 0.83±0.3 |
| 0.34 | 0.96±0.3 |
| 0.42 | 1.20±0.3 |

**$Na_2HPO_4$ (II, IX) (33, 54)**

For 0.4 M, $\Delta\gamma$ (air) from 18 to 30°C = 0.81 ± 0.2

**$Na_2HAsO_4$ (IX) (54)**

| | |
|---|---|
| 20.0°C | |
| 0.28 | 0.64±0.4 |
| 21.9°C | |
| 0.561 | 1.27±0.4 |

**$Na_2CO_3$ (I, II, III) (12, 43, 51, 61); *cf.* (10, 38)**

| | |
|---|---|
| 10°C | |
| 0.25 | 0.65±0.1 |
| 0.5 | 1.28±0.1 |
| 1.0 | 2.65±0.15 |
| 20°C | |
| 0.25 | 0.65±0.1 |
| 0.5 | 1.28±0.1 |
| 1.0 | 2.65±0.15 |
| 1.5 | 4.0 ±0.2 |
| 30°C | |
| 1.0 | 2.65±0.15 |

**$NaHCO_3$ (II) (5)**

For 0.5 M, $\gamma$ (air) at 25°C = 1.0 ± 0.3

**$NaCHO_2$, Formate (38, 59)**

**$NaC_2H_3O_2$, Acetate (38, 59)**

**$Na_2C_2O_4$, Oxalate (38)**

**$Na_2C_4H_4O_6$, Tartrate (38)**

**$NaC_4H_7O_2$, Butyrate (38)**

**$NaC_7H_5O_3$, Salicylate (38)**

**$Na_2CrO_4$, 30°C (II) (41)**

| M | $\Delta\gamma$ (air) |
|---|---|
| 0.51 | 1.4±*ca.* 25% |
| 1.95 | 6.1±*ca.* 25% |
| 3.31 | 11.4±*ca.* 25% |
| 5.10 | 19.7±*ca.* 25% |
| 6.12 | 25.3±*ca.* 25% |
| 6.99 | 27.4±*ca.* 25% |

**KOH, 15–18°C (I) (51, 59); *cf.* (10)**

| | |
|---|---|
| 0.5 | 0.89±0.2 |
| 1.0 | 1.78±0.2 |
| 1.5 | 2.67±0.2 |
| 2.0 | 3.53±0.3 |
| 3.8 | 6.7 ±0.5 |

**KCl (I, II, III, IX) (12, 13, 14, 15, 33, 51, 54, 61)**

| M | $\Delta\gamma$ (air) |
|---|---|
| 0°C | |
| 1.0 | 1.4 ±0.3 |
| 20°C | |
| 0.1 | 0.155±0.02 |
| 0.25 | 0.36 ±0.02 |
| 0.5 | 0.70 ±0.05 |
| 1.0 | 1.4 ±0.1 |
| 10, 20 and 30°C | |
| 2.0 | 2.78 ±0.1 |
| 3.0 | 4.15 ±0.1 |
| 4.0 | 5.50 ±0.2 |
| 4.4 | 6.03 ±0.2 |

**$KClO_3$ (V, IX) (54, 55)**

For 0.56 M, $\Delta\gamma$ (air) at 25°C = 0.25 ± 0.2

**$KClO_4$ (55)**

**KBr (I, II, V, IX) (33, 51, 54, 55)**

| | |
|---|---|
| 20°C | |
| 0.5 | 0.67±0.1 |
| 1.0 | 1.32±0.1 |
| 1.5 | 1.99±0.2 |
| 3.0 | 3.97±0.3 |
| 4.8 | 6.31±0.4 |
| 0 and 30°C | |
| 1.0 | 1.32±0.2 |

**KI (I, II, IX) (33, 51, 54)**

| | |
|---|---|
| 20°C | |
| 0.5 | 0.42±0.1 |
| 1.0 | 0.85±0.1 |
| 1.5 | 1.26±0.2 |
| 3.0 | 2.51±0.3 |
| 4.0 | 3.35±0.3 |
| 6.2 | 5.20±0.3 |
| 0 and 30°C | |
| 1.0 | 0.85±0.2 |

**$K_2SO_4$ (I, II, III, IX) (12, 33, 43, 44, 51, 54, 61)**

| | |
|---|---|
| 10 and 20°C | |
| 0.25 | 0.63±0.1 |
| 0.5 | 1.29±0.1 |
| 0.7 | 1.79±0.1 |
| 30°C | |
| 0.5 | 1.29±0.1 |

**$KNO_2$, 20°C (III) (48)**

| | |
|---|---|
| 36.02 | 22.25±*ca.* 0.5 |
| 30.07 | 18.95±*ca.* 0.5 |
| 22.61 | 15.25±*ca.* 0.5 |
| 17.67 | 12.25±*ca.* 0.5 |
| 11.75 | 8.95±*ca.* 0.5 |
| 8.002 | 6.75±*ca.* 0.5 |
| 5.036 | 4.65±*ca.* 0.5 |
| 2.938 | 3.25±*ca.* 0.5 |

**$KNO_3$, 10–30°C (I, III, IX) (12, 15, 25, 43, 51, 54, 61)**

| | |
|---|---|
| 0.02 | 0.03±0.02 |
| 0.1 | 0.11±0.03 |
| 0.25 | 0.26±0.04 |
| 0.5 | 0.51±0.05 |
| 1.0 | 1.03±0.1 |
| 1.5 | 1.55±0.1 |

**$KNO_3$.—(*Continued*)**

| M | $\Delta\gamma$ (air) |
|---|---|
| 2.0 | 2.05±0.1 |
| 2.5 | 2.50±0.2 |
| 3.9 | 3.70±0.3 |

**$K_3PO_4$ (33)**

**$KH_2PO_4$ (33)**

**$K_2CO_3$ (I, II, III) (12, 38, 43, 48, 51, 61)**

| | |
|---|---|
| 0°C | |
| 0.25 | 0.7 ±0.4 |
| 10°C | |
| 0.75 | 2.20±0.3 |
| 1.00 | 2.98±0.3 |
| 1.50 | 4.6 ±0.3 |
| 2.00 | 6.3 ±0.3 |
| 2.50 | 8.1 ±0.7 |
| 3.00 | 10.1 ±0.7 |
| 4.00 | 14.4 ±0.7 |
| 5.00 | 19.1 ±1.0 |
| 6.00 | 24.2 ±1.0 |
| 7.50 | 34.0 ±1.5 |
| 20°C | |
| 0.50 | 1.46±0.2 |
| 0.75 | 2.20±0.2 |
| 1.00 | 2.98±0.2 |
| 1.50 | 4.58±0.2 |
| 2.00 | 6.32±0.3 |
| 2.50 | 8.14±0.4 |
| 3.00 | 10.1 ±0.5 |
| 4.00 | 14.4 ±0.6 |
| 5.00 | 19.1 ±0.6 |
| 6.00 | 24.2 ±1.0 |
| 7.00 | 29.8 ±1.5 |
| 7.50 | 32.6 ±1.5 |
| 8.30 | 38.0 ±2.0 |
| 30°C* | |
| 0.75 | 2.20±0.3 |
| 1.00 | 2.98±0.3 |
| 1.50 | 4.6 ±0.4 |
| 2.00 | 6.3 ±0.8 |
| 2.50 | 8.1 ±1.0 |

**$K_2CO_3$.—(*Continued*)**

| M | $\Delta\gamma$ (air) |
|---|---|
| 30°C* | |
| 3.00 | 10.1 ±1.0 |
| 4.00 | 14.4 ±1.0 |
| 5.00 | 19.1 ±1.0 |
| 6.00 | 24.2 ±1.0 |
| 7.00 | 28.8 ±1.5 |
| 8.30 | 36.0 ±2.0 |

* $\Delta\gamma$ of Reybinder (48) is 0.4 to 0.8 dyne/cm higher at 30 than at 10°C for solutions more dilute than 4.0 M. The differences are of the opposite sign and much larger for the more concentrated solutions.

**$KCHO_2$, Formate (38)**

**$KC_2H_3O_2$, Acetate (IX) (54); *cf.* (38)**

For 0.56 M, $\Delta\gamma$ (air) at 13.3° = 0.25 ± 0.4

**$K_2C_4H_4O_6$, Tartrate (38)**

**$K_3C_6H_5O_7$, Citrate (38)**

**KCN, 15.3°C (IX) (54)**

| M | $\Delta\gamma$ (air) |
|---|---|
| 2.313 | 2.11±0.4 |

**$KMnO_4$ (54)**

**$K_4Fe(CN)_6$, 0–30°C (II, IX) (33, 54)**

| | |
|---|---|
| 0.25 | 0.85±0.2 |
| 0.55 | 1.87±0.3 |

**$K_3Fe(CN)_6$ (IX) (54)**

| M | $\Delta\gamma$ (air) | $t$, °C |
|---|---|---|
| 0.280 | 0.98±0.4 | 12.35 |
| 0.561 | 0.86±0.4 | 13.5 |
| 0.561 | 2.11±0.4 | 19.8 |
| 0.561 | 1.86±0.4 | 20.8 |

**$K_2CrO_4$, 10–15°C (I) (54, 59)**

| M | $\Delta\gamma$ (air) |
|---|---|
| 1.0 | 2.6±0.5 |
| 2.3 | 6.0±0.7 |

**$K_2Cr_2O_7$, 16°C (IX) (54)**

| | |
|---|---|
| 0.28 | 0.78±0.4 |

## ℭ-Table, ℭ-Arrangement (*v.* Vol. III, p. viii)

The surface tensions of aqueous solutions of organic acids and of the higher alcohols as determined by various workers are not in good agreement. The disagreements between values determined by the same method are on the whole as great as when different methods are used. This may be due to the presence of small amounts of impurities, incorrect use of methods of measurement, and in some cases to the formation of semisolid films at the surface.

**$CH_2O_2$, Formic acid; 30°C (II) (39)**

| Wt. % | $\gamma$ (air) ±0.5 | Wt. % | $\gamma$ (air) ±0.5 |
|---|---|---|---|
| 1.00 | 70.07 | 40.00 | 51.97 |
| 2.50 | 68.38 | 50.00 | 49.50 |
| 5.00 | 66.20 | 60.00 | 47.16 |
| 10.00 | 62.78 | 70.00 | 44.67 |
| 15.00 | 60.08 | 75.00 | 43.40 |
| 20.00 | 57.92 | 80.01 | 42.09 |
| 25.00 | 56.29 | 90.00 | 39.34 |
| 30.01 | 54.76 | 100.00 | 36.51 |

**15°C (I) (60)**

| $M/l_8$ | $\gamma$ (air) ±0.5 |
|---|---|
| 1.0 | 68.88 |
| 0.5 | 70.60 |
| 0.25 | 71.96 |
| 0.125 | 72.51 |

25 and 35°C (I) (8)

**$CH_4N_2O$, Urea**
15°C (I) (59)

| g/l$_s$ | γ (air) |
|---|---|
| 100 | 1.1 ±0.5 |
| 200 | 1.2 ±0.5 |

**$CH_4O$, Methyl alcohol**
30°C (II) (39)

| Wt. % | γ (air) ±0.2 |
|---|---|
| 1.011 | 68.44 |
| 2.500 | 65.32 |
| 4.997 | 60.98 |
| 9.994 | 54.60 |
| 15.00 | 49.89 |
| 20.00 | 46.05 |
| 25.00 | 43.00 |
| 29.98 | 40.27 |
| 39.98 | 36.09 |
| 50.00 | 32.92 |
| 60.00 | 30.38 |
| 70.00 | 28.15 |
| 75.00 | 27.08 |
| 80.03 | 26.03 |
| 90.01 | 23.90 |
| 100.00 | 21.76 |

γ (air) 15°C (I) (59) *cf.* (60)

**$CH_5NO_2$, Ammonium formate (38)**

**$C_2HCl_3O_2$, Trichloroacetic acid (I) (8)**

| Wt. % | γ (air) ±*ca.* 2.0 | |
|---|---|---|
| | 25°C | 35°C |
| 3.20 | 66.84 | 65.14 |
| 3.81 | 65.90 | 63.95 |
| 8.56 | 57.33 | 55.50 |
| 15.56 | 48.97 | 46.90 |
| 40.16 | 40.04 | 39.16 |
| 71.15 | 37.67 | 36.55 |
| 86.84 | 36.30 | 35.50 |

**$C_2H_2Cl_2O_2$, Dichloroacetic acid (I) (8)**

| Wt. % | γ (air) ±*ca.* 2 | |
|---|---|---|
| | 25°C | 35°C |
| 3.17 | 61.72 | 61.20 |
| 6.60 | 54.74 | 54.09 |
| 13.03 | 44.36 | 44.02 |
| 47.93 | 40.48 | 40.14 |
| 98.42 | 36.87 | 35.35 |

**$C_2H_2O_4$, Oxalic acid**
20°C (II) (24); *cf.* (38, 60)

| M | γ (air) ±*ca.* 0.5 |
|---|---|
| 1.000 | 71.86 |
| 0.500 | 72.07 |
| 0.250 | 72.23 |
| 0.125 | 72.41 |
| 0.0625 | 72.53 |

**$C_2H_2O_4$.—(*Cont'd*)**

| M | γ (air) ±*ca.* 0.5 |
|---|---|
| 0.0313 | 72.61 |
| 0.0156 | 72.69 |
| 0.00781 | 72.71 |
| 0.00390 | 72.72 |

**$C_2H_3BrO_2$, Bromoacetic acid; $a^2$ (air)**
22°C (I) (58)

**$C_2H_3ClO_2$, Chloroacetic acid (I) (8)**

| Wt. % | γ (air) ±*ca.* 2.0 | |
|---|---|---|
| | 25°C | 35°C |
| 3.35 | 66.40 | 65.00 |
| 7.70 | 61.22 | 60.00 |
| 10.09 | 58.91 | 57.89 |
| 31.54 | 50.34 | 49.44 |
| 49.97 | 47.68 | 46.69 |
| 60.01 | 46.81 | 45.43 |
| 72.11 | 45.09 | 43.95 |

**$C_2H_4O$, Acetaldehyde**
22°C (I) (58)

| M/l$_s$ | $a^2$ (air) ±2% |
|---|---|
| 4.54 | 0.09471 |
| 2.27 | 0.1111 |
| 1.14 | 0.1240 |
| 0.568 | 0.1339 |
| 0.284 | 0.1405 |

**$C_2H_4O_2$, Acetic acid**
30°C (II) (39)

| Wt. % | γ (air) ±0.5 |
|---|---|
| 0.000 | 71.23 |
| 1.000 | 67.98 |
| 2.475 | 64.42 |
| 5.001 | 60.11 |
| 10.01 | 54.56 |
| 14.98 | 50.53 |
| 20.09 | 47.72 |
| 30.09 | 43.60 |
| 40.11 | 40.68 |
| 49.96 | 38.38 |
| 60.05 | 36.25 |
| 69.91 | 34.26 |
| 79.88 | 32.12 |
| 100.00 | 26.58 |

15°C (I) (60)

| M/l$_s$ | γ (air) ±0.5 |
|---|---|
| 1 | 60.90 |
| 0.5 | 65.06 |
| 0.25 | 68.64 |
| 0.125 | 70.78 |
| 0.0625 | 71.99 |

**$C_2H_4O_2$.—(*Cont'd*) (I) (8)**

| Wt. % | γ (air) ±2 | |
|---|---|---|
| | 25°C | 35°C |
| 2.17 | 65.32 | 64.16 |
| 5.94 | 59.06 | 58.03 |
| 10.99 | 52.79 | 52.12 |
| 19.25 | 47.89 | 47.05 |
| 41.49 | 40.19 | 39.23 |
| 51.84 | 37.81 | 37.04 |
| 65.25 | 35.15 | 34.16 |
| 83.08 | 31.11 | 30.28 |
| 91.37 | 28.88 | 28.03 |
| 93.53 | 27.87 | 26.90 |

**$C_2H_4O_2$, Methyl formate**
22°C (I) (58)

| M/l$_s$ | $a^2$ (air) ±2% |
|---|---|
| 2.627 | 0.07413 |
| 1.313 | 0.1033 |
| 0.657 | 0.1217 |
| 0.328 | 0.1330 |
| 0.164 | 0.1409 |
| 0.082 | 0.1458 |

**$C_2H_5NO$, Acetamide**
15°C (I) (60)

| M/l$_s$ | γ (air) ±2% |
|---|---|
| 1.0 | 69.79 |
| 0.5 | 71.60 |
| 0.25 | 72.59 |
| 0.125 | 73.04 |

**$C_2H_6O$, Ethyl alcohol**
15°C (I) (59); *cf.* (60)

| Wt. % | γ (air) ±0.4 |
|---|---|
| 1.96 | 64.60 |
| 3.85 | 58.37 |
| 9.09 | 49.96 |
| 16.7 | 41.74 |
| 33.3 | 32.39 |
| 44.4 | 29.68 |
| 100.0 | 22.88 |

25°C (II) (2)

| Wt. % | γ (air) ±0.3 |
|---|---|
| 0.00 | 72.20 |
| 2.72 | 60.79 |
| 5.21 | 54.87 |
| 11.10 | 46.03 |
| 20.50 | 37.53 |
| 30.47 | 32.25 |
| 40.00 | 29.63 |
| 50.22 | 27.89 |
| 59.58 | 26.71 |
| 68.94 | 25.71 |
| 77.98 | 24.73 |
| 87.92 | 23.64 |
| 92.10 | 23.18 |
| 97.00 | 22.49 |
| 100.00 | 22.03 |

**$C_2H_6O$.—(*Cont'd*)**
30°C (II) (39)

| Wt. % | γ (air) ±0.2 |
|---|---|
| 0.000 | 71.23 |
| 0.979 | 66.08 |
| 2.143 | 61.56 |
| 4.994 | 54.15 |
| 10.385 | 45.88 |
| 17.979 | 38.54 |
| 25.00 | 34.08 |
| 29.98 | 31.89 |
| 34.89 | 30.32 |
| 50.00 | 27.45 |
| 60.04 | 26.24 |
| 71.85 | 25.05 |
| 75.06 | 24.68 |
| 84.57 | 23.61 |
| 95.57 | 22.09 |
| 100.00 | 21.47 |

**$C_2H_6O_2$, Glycol**
15°C (I) (60)

| M/l$_s$ | γ (air) ±2% |
|---|---|
| 1.0 | 70.94 |
| 0.5 | 72.36 |
| 0.25 | 73.02 |
| 0.125 | 73.27 |

**$C_2H_7NO_2$, Ammonium acetate (38)**

**$C_2H_8N_2O_4$, Ammonium oxalate (38)**

**$C_3H_4O_4$, Malonic acid; γ (air) 15°C (I) (60); 20°C (II) (24)**

**$C_3H_6O$, Allyl alcohol**
15°C (I) (60)

| M/l$_s$ | γ (air) ±2% |
|---|---|
| 1.0 | 51.49 |
| 0.5 | 59.08 |
| 0.25 | 64.94 |
| 0.125 | 68.73 |
| 0.0625 | 70.85 |
| 0.03125 | 72.29 |

**$C_3H_6O$, Propionaldehyde; $a^2$ (air)**
22°C (I) (58)

**$C_3H_6O$, Acetone**
(II) (40)

| Wt. % | γ (air) ±0.2 | | |
|---|---|---|---|
| | 0°C | 25°C | 45°C |
| 0 | 75.76 | 71.95 | 68.69 |
| 5 | 59.54 | 55.45 | 52.52 |
| 10 | 53.24 | 48.94 | 45.87 |
| 20 | 45.21 | 41.11 | 38.14 |
| 25 | 42.33 | 38.25 | 35.24 |
| 30 | 40.01 | 35.98 | 33.18 |
| 40 | 36.20 | 32.69 | 30.06 |
| 50 | 33.53 | 30.38 | 27.86 |
| 75 | 29.59 | 26.75 | 24.46 |
| 85 | 28.52 | 25.59 | 23.28 |
| 90 | 27.96 | 25.02 | 22.64 |
| 95 | 27.24 | 24.19 | 21.71 |
| 100 | 26.13 | 23.04 | 20.55 |

**$C_3H_6O$.—(*Cont'd*)**
15°C (I) (60)

| M/l$_s$ | γ (air) ±*ca.* 0.5 |
|---|---|
| 0.0313 | 71.73 |
| 0.0625 | 70.43 |
| 0.125 | 68.49 |
| 0.25 | 65.31 |
| 0.5 | 61.06 |
| 1.0 | 55.62 |

**$C_3H_6O_2$, Ethyl formate**
22°C (I) (58)

| M/l$_s$ | $a^2$ (air) ±2% |
|---|---|
| 0.675 | 0.09948 |
| 0.338 | 0.1136 |
| 0.169 | 0.1298 |
| 0.084 | 0.1379 |

**$C_3H_6O_2$, Methyl acetate**
15°C (I) (60)

| M/l$_s$ | γ (air) ±2% |
|---|---|
| 1.0 | 47.47 |
| 0.5 | 55.56 |
| 0.25 | 61.68 |
| 0.125 | 66.09 |
| 0.0625 | 69.20 |
| 0.03125 | 71.06 |

**$C_3H_6O_2$, Propionic acid**
15°C (I) (60)

| M/l$_s$ | γ (air) ±2.0 |
|---|---|
| 1.0 | 48.60 |
| 0.5 | 55.56 |
| 0.25 | 61.80 |
| 0.125 | 66.21 |
| 0.0625 | 69.35 |
| 0.03125 | 71.24 |
| 0.015625 | 72.40 |

(I, III) (47)

| M/l$_s$ | γ (air) ±3.0 | | |
|---|---|---|---|
| | 0°C | 10°C | 20°C |
| 0.0 | 75.90 | 74.20 | 72.70 |
| 0.100 | 68.25 | | 65.50 |
| 0.238 | 62.50 | 61.28 | 60.00 |
| 0.952 | 49.22 | 47.79 | 46.66 |
| 2.000 | 41.00 | | 38.75 |
| 3.806 | 35.00 | 34.53 | 34.06 |
| | 40°C | 60°C | 80°C |
| 0.0 | 69.45 | 66.10 | 62.82 |
| 0.100 | 63.25 | | 58.50 |
| 0.238 | 58.19 | 56.05 | 54.26 |
| 0.952 | 45.00 | 43.65 | 42.46 |
| 2.000 | 37.70 | | 35.70 |
| 3.806 | 33.10 | 31.86 | 30.90 |
| | 100°C | | |
| 0.0 | 59.60 | 0.952 | 41.51 |
| 0.238 | 52.51 | 3.806 | 30.05 |

**$C_3H_6O_2$.—(*Cont'd*) (I) (8)**

| Wt. % | γ (air) ±*ca.* 2.0 | |
|---|---|---|
| | 25°C | 35°C |
| 0.988 | 64.46 | 63.31 |
| 1.914 | 59.78 | 58.74 |
| 5.84 | 49.05 | 48.45 |
| 9.82 | 43.86 | 43.03 |
| 21.71 | 36.37 | 35.71 |
| 49.80 | 31.69 | 31.06 |
| 73.92 | 29.67 | 28.95 |
| 99.99 | 25.64 | 24.72 |

20°C (II) (18)

| M | γ (air) ±*ca.* 2.0 |
|---|---|
| 0.0157 | 72.80 |
| 0.0317 | 72.70 |
| 0.0528 | 70.76 |
| 0.126 | 66.98 |
| 0.254 | 64.01 |
| 0.518 | 55.62 |
| 1.080 | 48.52 |
| 2.55 | 41.21 |
| 5.50 | 35.54 |

**$C_3H_7N$, Allylamine**
γ (air) 15°C (I) (60)

**$C_3H_8O$, Propyl alcohol**
15°C (I) (60)

| M/l$_s$ | γ (air) ±0.4 |
|---|---|
| 0.0313 | 70.76 |
| 0.0625 | 68.64 |
| 0.125 | 65.08 |
| 0.25 | 59.34 |
| 0.5 | 51.94 |
| 1.0 | 43.59 |

**$C_3H_8O$, Isopropyl alcohol**
15°C (I) (60)

| M/l$_s$ | γ (air) ±2% |
|---|---|
| 1.0 | 46.58 |
| 0.5 | 53.66 |
| 0.25 | 60.37 |
| 0.125 | 65.21 |
| 0.0625 | 68.56 |
| 0.0313 | 70.77 |

**$C_3H_8O_3$, Glycerol**
15–18°C (I) (9, 59)

| Wt. % | Δγ (air) |
|---|---|
| 5 | −0.15 ±0.5 |
| 10 | −0.2 ±0.5 |
| 15 | −0.4 ±0.5 |
| 20 | −0.65 ±0.7 |
| 30 | −1.4 ±1.0 |
| 50 | −3.2 ±2.0 |
| 85 | −7.3 ±2.5 |
| 98 | −9.3 ±3 0 |
| 100 | −9.7 ±3 0 |

$C_3H_9N$, Propylamine
15°C (I) (60)

| M/l | γ (air) ±2% |
|---|---|
| 1.0 | 46.68 |
| 0.5 | 53.03 |
| 0.25 | 59.55 |
| 0.125 | 64.09 |
| 0.0625 | 68.43 |
| 0.03125 | 70.39 |

$C_4H_4O_4$, Fumaric acid
20°C (II) (24)

| M | γ (air) ±ca. 0.5 |
|---|---|
| 0.0500 | 72.01 |
| 0.0250 | 72.31 |
| 0.0125 | 72.51 |
| 0.00625 | 72.59 |

15°C (I) (60)

| | |
|---|---|
| 0.0813 | 73.19 |

$C_4H_4O_4$, Maleic acid
20°C (II) (24)

| M | γ (air) ±ca. 1.0 |
|---|---|
| 0.935 | 66.80 |
| 0.468 | 69.06 |
| 0.234 | 70.48 |
| 0.117 | 71.41 |
| 0.0584 | 72.03 |
| 0.0292 | 72.35 |
| 0.0146 | 72.56 |

γ (air) 15°C (I) (60)

$C_4H_6O_4$, Succinic acid
20°C (II) (24)

| M | γ (air) ±ca. 2.0 |
|---|---|
| 0.500 | 68.05 |
| 0.250 | 69.70 |
| 0.125 | 70.95 |
| 0.0625 | 71.74 |
| 0.0313 | 72.21 |
| 0.0156 | 72.39 |
| 0.00781 | 72.50 |

γ (air) 15°C (I) (60)

$C_4H_6O_4$, Dimethyl oxalate
γ (air) 15°C (I) (60)

$C_4H_6O_5$, Malic acid
20°C (II) (24)

| M | γ (air) ±ca. 2.0 |
|---|---|
| 0.774 | 67.08 |
| 0.387 | 69.26 |
| 0.193 | 70.67 |
| 0.0967 | 71.53 |
| 0.0483 | 72.10 |
| 0.0239 | 72.40 |
| 0.0115 | 72.61 |

γ (air) 15°C (I) (60)

$C_4H_6O_6$, *d*-Tartaric acid
20°C (II) (24); *cf.* (38, 59, 60)

| M | γ (air) ±ca. 1.0 |
|---|---|
| 8.00 | 74.13 |
| 4.00 | 73.26 |
| 2.00 | 72.90 |
| 1.00 | 72.70 |
| 0.500 | 72.68 |
| 0.250 | 72.64 |
| 0.125 | 72.66 |

$C_4H_6O_6$, *dl*-Tartaric acid (59)

$C_4H_7NO_4$, Aspartic acid (60)

$C_4H_8O$, *n*-Butyraldehyde; γ (air) 15°C (I) (60)

$C_4H_8O_2$, *n*-Butyric acid (I) (56)

| M/l | γ (air) ±ca. 2.0 |
|---|---|
| 2°C | |
| 0.000 | 75.39 |
| 0.091 | 61.48 |
| 0.182 | 54.87 |
| 0.364 | 47.29 |
| 0.748 | 38.88 |
| 18°C | |
| 0.0000 | 73.10 |
| 0.0242 | 68.72 |
| 0.0363 | 66.57 |
| 0.0545 | 64.06 |
| 0.0817 | 60.84 |
| 0.122 | 57.23 |
| 0.184 | 53.07 |
| 0.276 | 48.74 |
| 0.414 | 44.09 |
| 0.621 | 39.26 |
| 0.931 | 34.53 |
| 25°C | |
| 0.0000 | 72.01 |
| 0.0275 | 66.48 |
| 0.0550 | 62.59 |
| 0.1098 | 57.23 |
| 0.2193 | 50.60 |
| 0.4385 | 43.00 |
| 0.877 | 34.79 |
| 15°C (I) (60) | |
| 0.00781 | 71.85 |
| 0.0156 | 70.48 |
| 0.0313 | 67.60 |
| 0.0625 | 63.25 |
| 0.125 | 56.58 |
| 0.25 | 49.27 |
| 0.5 | 41.15 |
| 1.0 | 33.34 |

$C_4H_8O_2$.—(*Cont'd*)
(I, III) (47)

| M/l | γ (air) ±ca. 2.0 | | |
|---|---|---|---|
| | 0°C | 10°C | 20°C |
| 0.007 | 73.65 | 72.58 | 71.25 |
| 0.021 | 70.95 | 69.51 | 68.12 |
| 0.050 | 65.50 | 64.30 | 63.58 |
| 0.104 | 62.00 | 59.85 | 58.60 |
| 0.246 | 52.18 | 51.09 | 50.30 |
| 0.489 | 45.91 | 44.00 | 42.57 |
| 1.006 | 35.87 | 34.81 | 33.78 |
| 11.04 | 28.22 | | 26.61 |
| | 40°C | 60°C | 80°C |
| 0.007 | 68.40 | 65.31 | 62.21 |
| 0.021 | 65.80 | 63.45 | 60.50 |
| 0.050 | 62.21 | 60.42 | 58.17 |
| 0.104 | 56.81 | 55.22 | 53.86 |
| 0.246 | 48.81 | 47.48 | 46.59 |
| 0.489 | 40.92 | 39.98 | 39.50 |
| 1.006 | 32.48 | 31.41 | 31.12 |
| 11.04 | | 23.21 | 21.45 |
| 100°C | | | |
| 0.007 | 59.00 | 0.246 | 46.05 |
| 0.021 | 57.38 | 0.489 | 39.21 |
| 0.050 | 55.50 | 1.006 | 31.00 |
| 0.104 | 52.34 | 11.04 | 19.70 |

(I) (8)

| Wt. % | γ (air) ±ca. 2.0 | |
|---|---|---|
| | 25°C | 35°C |
| 0.14 | 69.36 | 67.96 |
| 0.31 | 64.82 | 63.81 |
| 0.73 | 59.63 | 58.38 |
| 1.05 | 56.03 | 55.07 |
| 3.83 | 41.56 | 40.85 |
| 8.63 | 32.84 | 32.19 |
| 24.96 | 28.02 | 27.47 |
| 79.38 | 26.94 | 26.69 |
| 100.2 | 26.00 | 25.14 |

20°C (II) (18)

| M | γ (air) ±ca. 2.0 |
|---|---|
| 0.0066 | 72.29 |
| 0.013 | 71.22 |
| 0.024 | 68.72 |
| 0.050 | 64.69 |
| 0.101 | 58.63 |
| 0.159 | 54.04 |
| 0.322 | 46.17 |
| 0.663 | 38.31 |
| 1.409 | 30.95 |
| 3.22 | 28.65 |
| 11.0 | 28.29 |
| 117.0 | 27.40 |

$C_4H_8O_2$, Isobutyric acid (I) (8)
For two-layer systems, *v.* (64)

| Wt. % | γ (air) ±ca. 1.0 | |
|---|---|---|
| | 25°C | 35°C |
| 0.10 | 69.64 | 68.03 |
| 0.43 | 62.59 | 61.48 |
| 0.76 | 58.41 | 57.54 |
| 1.92 | 49.62 | 48.81 |
| 5.65 | 37.31 | 36.48 |
| 11.69 | 29.82 | 29.23 |

$C_4H_8O_2$.—(*Cont'd*)

| Wt. % | γ (air) ±ca. 1.0 | |
|---|---|---|
| | 25°C | 35°C |
| 18.95 | 27.30 | 27.04 |
| 69.93 | 26.50 | 25.78 |
| 101.1 | 24.49 | 23.38 |

15°C (I) (60)

| M/l | γ (air) ±ca. 1.0 |
|---|---|
| 0.00781 | 71.85 |
| 0.0156 | 70.17 |
| 0.0313 | 67.05 |
| 0.0625 | 62.21 |
| 0.125 | 55.83 |
| 0.25 | 48.64 |
| 0.5 | 40.74 |
| 1.0 | 32.79 |

18°C (I) (56)

| | |
|---|---|
| 0.0000 | 73.10 |
| 0.0187 | 68.76 |
| 0.0250 | 67.44 |
| 0.0375 | 65.11 |
| 0.050 | 63.39 |
| 0.075 | 60.07 |
| 0.100 | 57.81 |
| 0.125 | 55.66 |
| 0.150 | 53.69 |
| 0.200 | 50.99 |
| 0.250 | 48.37 |
| 0.30 | 46.48 |
| 0.40 | 43.45 |
| 0.50 | 40.83 |
| 0.60 | 38.47 |
| 0.80 | 35.12 |
| 1.00 | 32.77 |
| 1.20 | 31.07 |
| 25°C | |
| 0.0250 | 66.91 |
| 0.0370 | 64.67 |
| 0.0555 | 62.01 |
| 0.0833 | 58.82 |
| 0.125 | 55.19 |
| 0.187 | 51.02 |
| 0.281 | 46.71 |
| 0.422 | 41.98 |
| 0.633 | 37.27 |
| 0.949 | 32.61 |
| 2°C | |
| 0.0296 | 68.69 |
| 0.0592 | 63.95 |
| 0.1185 | 58.08 |
| 0.2375 | 51.10 |
| 0.475 | 42.74 |
| 0.950 | 35.61 |

$C_4H_8O_2$, Ethyl acetate
15°C (I) (60)

| M/l | γ (air) ±2% |
|---|---|
| 0.5 | 42.63 |
| 0.25 | 51.09 |
| 0.125 | 57.77 |
| 0.0625 | 63.29 |
| 0.03125 | 66.94 |

$C_4H_8O_2$.—(*Cont'd*)

| M/l | γ (air) ±2% |
|---|---|
| 0.0156 | 69.90 |
| 0.0078 | 71.54 |

$C_4H_8O_2$, Methyl propionate
15°C (I) (60)

| | |
|---|---|
| 0.5 | 41.61 |
| 0.25 | 51.28 |
| 0.125 | 58.39 |
| 0.0625 | 63.87 |
| 0.03125 | 67.75 |
| 0.0156 | 70.29 |
| 0.0078 | 71.72 |

$C_4H_8O_2$, Propyl formate
15°C (I) (60)

| | |
|---|---|
| 0.25 | 48.58 |
| 0.125 | 58.92 |
| 0.0625 | 64.23 |
| 0.03125 | 68.25 |
| 0.0156 | 70.25 |
| 0.0078 | 71.68 |

$C_4H_8O_3$, Hydroxyisobutyric acid
15°C (I) (60)

| | |
|---|---|
| 0.5 | 60.87 |
| 0.25 | 65.06 |
| 0.125 | 68.45 |
| 0.0625 | 70.59 |
| 0.03125 | 72.08 |

$C_4H_{10}O$, *n*-Butyl alcohol
20°C (II) (18)

| M | γ (air) ±ca. 1.0 |
|---|---|
| 0.00329 | 72.80 |
| 0.00658 | 72.36 |
| 0.0132 | 71.26 |
| 0.0264 | 67.17 |
| 0.0536 | 63.14 |
| 0.105 | 56.03 |
| 0.211 | 48.08 |
| 0.433 | 40.38 |
| 0.854 | 28.57 |

$C_4H_{10}O$, Isobutyl alcohol
15°C (I) (59)

| Wt. % | γ (air) ±ca. 1.0 |
|---|---|
| 0.249 | 65.60 |
| 0.99 | 52.99 |
| 1.96 | 45.35 |
| 2.91 | 40.33 |
| 4.76 | 34.04 |
| 7.41 | 27.97 |
| 100 | 22.91 |

15°C (I) (60)

| M/l | γ (air) ±ca. 1.0 |
|---|---|
| 0.0156 | 69.25 |
| 0.0313 | 66.30 |
| 0.0625 | 60.52 |
| 0.125 | 54.25 |

$C_4H_{10}O$.—(*Cont'd*)

| M/l | γ (air) ±ca. 1.0 |
|---|---|
| 0.25 | 45.29 |
| 0.5 | 36.31 |
| 1.0 | 27.21 |

(I) (65)

| Wt. % | t, °C | γ (air) ±ca. 1.0 |
|---|---|---|
| 7.49 | 15 | 28.00 |
| | 44 | 24.37 |
| | 76 | 20.76 |
| 4.64 | 16 | 33.66 |
| | 46 | 30.14 |
| | 65 | 28.01 |
| 2.37 | 14 | 41.87 |
| | 50 | 37.13 |
| | 80 | 33.53 |
| 1.20 | 14 | 53.64 |
| | 46 | 49.55 |
| | 78 | 45.34 |

$C_4H_{10}O$, *tert.*-Butyl alcohol
22°C (I) (58)

| M/l | $a^2$ (air) ±2% |
|---|---|
| 0.337 | 0.09859 |
| 0.169 | 0.1120 |
| 0.084 | 0.1218 |

$C_4H_{12}ClN$, Tetramethylammonium chloride
0°C (I, III) (47)

| M | Δγ (air) ±ca. 0.5 |
|---|---|
| 0.50 | 0.42 |
| 1.00 | 0.65 |
| 2.00 | 1.60 |

$C_5H_8O_2$, Allyl acetate; γ (air) 15°C (I) (60)

$C_5H_{10}O_2$, *n*-Valeric acid (I) (8)

| Wt. % | γ (air) ±3.0 | |
|---|---|---|
| | 25°C | 35°C |
| 0.11 | 64.96 | 63.81 |
| 0.22 | 58.70 | 57.40 |
| 0.38 | 53.51 | 52.05 |
| 0.83 | 41.99 | 41.34 |
| 2.34 | 32.12 | 31.41 |
| 3.17 | 30.68 | 29.86 |
| 87.04 | 25.42 | 24.09 |
| 98.91 | 26.50 | 25.57 |

(III) (47)

| M/l | γ (air) ±ca. 2 | | |
|---|---|---|---|
| | 0°C | 20°C | 40°C |
| 0.0103 | 67.03 | 65.45 | 63.77 |
| 0.0206 | 60.55 | 59.78 | 58.20 |
| 0.0683 | 52.10 | 49.81 | 48.35 |
| 0.2049 | 37.55 | 35.20 | 33.85 |
| | 60°C | 80°C | 90°C |
| 0.0103 | 61.94 | 60.36 | 59.54 |
| 0.0206 | 57.14 | 56.33 | 55.99 |
| 0.0683 | 48.11 | 48.02 | 48.00 |
| 0.2049 | 33.42 | 33.37 | |

**$C_5H_{10}O_2$.—(*Cont'd*)**
17.5°C (I) (56)

| M/$l_s$ | γ (air) ±2 |
|---|---|
| 0.0093 | 68.04 |
| 0.0140 | 65.56 |
| 0.0210 | 62.31 |
| 0 0315 | 58.65 |
| 0.0475 | 54.15 |
| 0.071 | 49.80 |
| 0.107 | 44.89 |
| 0.160 | 39.86 |
| 0.240 | 34.70 |

**$C_5H_{10}O_2$, Isovaleric acid** (I) (8)

| Wt. % | γ (air) ±*ca.* 2.0 25°C | 35°C |
|---|---|---|
| 0.15 | 63.74 | 62.82 |
| 0.34 | 56.90 | 56.27 |
| 1.03 | 45.30 | 44.02 |
| 2.54 | 34.57 | 33.66 |
| 4.24 | 29.17 | 28.38 |
| 89.37 | 24.56 | 23.52 |
| 99.77 | 24.92 | 24.16 |

19°C (I) (56)

| M/$l_s$ | γ (air) ±*ca.* 2.0 |
|---|---|
| 0.00425 | 70.53 |
| 0.0085 | 68.05 |
| 0.0128 | 65.79 |
| 0.0170 | 63.97 |
| 0.0212 | 62.22 |
| 0.0256 | 60.62 |
| 0.034 | 58.07 |
| 0.0425 | 56.03 |
| 0.051 | 54.06 |
| 0.068 | 51.14 |
| 0.085 | 48.66 |
| 0.102 | 46.69 |
| 0.170 | 40.78 |
| 0.204 | 38.53 |

15°C (I) (60)

| M/$l_s$ | γ (air) ±2% |
|---|---|
| 0.25 | 35.93 |
| 0.125 | 44.28 |
| 0.0625 | 52.10 |
| 0.0312 | 59.11 |
| 0.0156 | 65.03 |
| 0.00781 | 67.78 |
| 0.00391 | 71.34 |

**$C_5H_{10}O_2$, Isobutyl formate; $a^2$ (air)** 22°C (I) (58)

**$C_5H_{10}O_2$, Ethyl propionate**
15°C (I) (60)

| M/$l_s$ | γ (air) ±2% |
|---|---|
| 0.125 | 46.79 |
| 0.0625 | 54.68 |
| 0.03125 | 60.53 |

**$C_5H_{10}O_2$.—(*Cont'd*)**

| M/$l_s$ | γ (air) ±2% |
|---|---|
| 0.0156 | 65.18 |
| 0.0078 | 68.69 |
| 0.0039 | 70.88 |

**$C_5H_{10}O_2$, Methyl butyrate**
22°C (I) (58)

| M/$l_s$ | $a^2$ (air) ±2% |
|---|---|
| 0.123 | 0.09177 |
| 0.0612 | 0.1120 |
| 0.0306 | 0.1249 |
| 0.0153 | 0.1354 |

**$C_5H_{10}O_2$, Propyl acetate**
15°C (I) (60)

| M/$l_s$ | γ (air) ±2% |
|---|---|
| 0.125 | 44.78 |
| 0.0625 | 52.73 |
| 0.03125 | 59.33 |
| 0.0156 | 64.27 |
| 0.0078 | 68.20 |
| 0.0039 | 70.56 |

**$C_5H_{12}O$, Isoamyl alcohol**
30°C (II) (39)
For two-layer systems, *v.* (36)

| Wt. % | γ (air) ±*ca.* 1.0 |
|---|---|
| 0.250 | 54.70 |
| 0.50 | 47.34 |
| 0.75 | 42.51 |
| 1.00 | 38.88 |
| 1.50 | 33.62 |
| 2.00 | 29.66 |
| 2.50 | 26.60 |

15°C (I) (59); *cf.* (60, 68)

| Wt. % | γ (air) ±*ca.* 1.0 |
|---|---|
| 0.249 | 57.02 |
| 0.5 | 49.30 |
| 0.99 | 41.07 |
| 1.48 | 36.03 |
| 1.96 | 32.31 |
| 100.0 | 22.99 |

**$C_5H_{12}O$, *tert.*-Amyl alcohol**
15°C (I) (60)

| M/$l_s$ | γ (air) ±2% |
|---|---|
| 0.5 | 36.57 |
| 0.25 | 43.86 |
| 0.125 | 50.55 |
| 0.0625 | 56.91 |
| 0.03125 | 62.24 |
| 0.0156 | 66.63 |
| 0.0078 | 69.54 |
| 0.0039 | 71.41 |

**$C_6H_6O$, Phenol**
20°C (I, II) (17, 35, 65)
For saturated solutions, *v.* (13, 36, 64); for other temps., *v.* (65)

| Wt. % | γ (air) |
|---|---|
| 0.00 | (72.8) |
| 0.024 | 72.6±0.2 |
| 0.047 | 72.2±0.2 |
| 0.094 | 71.7±0.2 |
| 0.118 | 71.3±0.2 |
| 0.236 | 69.9±0.3 |
| 0.471 | 66.5±0.3 |
| 0.706 | 64.9±0.3 |
| 0.941 | 61.1±0.3 |
| 1.412 | 57.0±0.3 |
| 1.881 | 54.0±0.3 |
| 2.350 | 51.3±0.4 |
| 2.819 | 49.1±0.4 |
| 3.755 | 46.0±0.4 |
| 4.692 | 43.8±0.5 |
| 5.623 | 42.3±0.5 |

**$C_6H_6O_2$, Pyrocatechol**
20°C (II) (17)

| M/$l_s$ | γ ($H_2$) ±*ca.* 2.0 |
|---|---|
| 0.03 | 72.08 |
| 0.05 | 71.66 |
| 0.10 | 69.72 |
| 0.20 | 66.83 |
| 0.30 | 66.44 |
| 0.40 | 62.42 |
| 0.50 | 60.78 |
| 0.60 | 59.67 |
| 0.75 | 57.75 |
| 1.0 | 55.74 |
| 2.0 | 51.56 |

**$C_6H_6O_2$, Resorcinol**
20°C (II) (17)

| | |
|---|---|
| 0.03 | 72.12 |
| 0.05 | 71.39 |
| 0.10 | 70.62 |
| 0.15 | 69.62 |
| 0.20 | 68.84 |
| 0.30 | 67.74 |
| 0.40 | 66.80 |
| 0.50 | 66.24 |
| 0.60 | 65.44 |
| 0.75 | 64.36 |
| 1.0 | 63.41 |
| 1.5 | 61.14 |
| 2.0 | 60.46 |
| 3.0 | 58.63 |
| 4.0 | 58.16 |
| 5.0 | 57.57 |
| 6.0 | 57.06 |

**$C_6H_6O_2$, Hydroquinol**
20°C (II) (17)

| | |
|---|---|
| 0.05 | 72.27 |
| 0.10 | 71.63 |
| 0.20 | 70.71 |

**$C_6H_6O_2$.—(*Cont'd*)**

| M/$l_s$ | γ ($H_2$) ±*ca.* 2.0 |
|---|---|
| 0.30 | 70.19 |
| 0.35 | 69.65 |
| 0.45 | 69.51 |
| 0.50 | 69.05 |

**$C_6H_6O_3$, Pyrogallol**
20°C (II) (17)

| | |
|---|---|
| 0.1 | 71.71 |
| 0.2 | 70.38 |
| 0.3 | 68.24 |
| 0.5 | 65.74 |
| 0.6 | 64.87 |
| 0.75 | 62.37 |
| 1.00 | 60.00 |
| 1.50 | 56.10 |
| 2.00 | 53.80 |

**$C_6H_7N$, Aniline** (65)‡‡; for two-layer systems, *v.* (64)

**$C_6H_8O_7$, Citric acid** (38, 59)

**$C_6H_{12}O_2$, *n*-Caproic acid**
19°C (I) (56)

| M/$l_s$ | γ (air) ±*ca.* 2.0 |
|---|---|
| 0.00212 | 69.95 |
| 0.00425 | 66.59 |
| 0.0064 | 63.17 |
| 0.0085 | 60.25 |
| 0.0128 | 55.58 |
| 0.0170 | 51.89 |
| 0.0212 | 49.16 |
| 0.0256 | 46.90 |
| 0.0340 | 42.89 |
| 0.0425 | 39.90 |
| 0.051 | 37.35 |
| 0.068 | 34.14 |
| 0.085 | 30.89 |

(III) (47)

| M/$l_s$ | γ (air) ±*ca.* 2.0 0°C | 10°C | 20°C |
|---|---|---|---|
| 0.0010 | 74.00 | 72.75 | 71.20 |
| 0.0050 | 65.88 | | 63.69 |
| 0.0100 | 60.05 | 58.68 | 57.50 |
| 0.0200 | 53.00 | 51.10 | 49.59 |
| 0.0250 | 50.35 | 48.05 | 46.33 |
| 0.0300 | 47.96 | 45.15 | 43.25 |
| 0.0350 | 45.95 | 43.00 | 41.00 |
| | 40°C | 60°C | 80°C |
| 0.0010 | 68.39 | 65.42 | 62.48 |
| 0.0050 | 62.21 | 60.88 | 59.61 |
| 0.0100 | 56.00 | 55.18 | 55.00 |
| 0.0200 | 47.55 | 46.50 | 46.00 |
| 0.0250 | 44.08 | 43.00 | 42.78 |
| 0.0300 | 41.14 | 40.10 | 40.00 |
| 0.0350 | 38.88 | 38.10 | 37.70 |
| | 90°C | | |
| 0.0010 | 60.90 | | |

**$C_6H_{12}O_2$, Isocaproic acid**
18°C (I) (56)

| M/$l_s$ | γ (air) ±*ca.* 2.0 |
|---|---|
| 0.0016 | 70.87 |
| 0.0024 | 69.52 |
| 0.0036 | 67.36 |
| 0.0054 | 64.15 |
| 0.0081 | 60.23 |
| 0.0122 | 55.88 |
| 0.0183 | 50.95 |
| 0.0274 | 46.02 |
| 0.0411 | 41.16 |
| 0.0616 | 35.89 |
| 0.0924 | 30.67 |

**$C_6H_{12}O_2$, Isoamyl formate**
22°C (I) (58)

| M/$l_s$ | $a^2$ (air) ±2% |
|---|---|
| 0.0269 | 0.1002 |
| 0.0135 | 0.1168 |

**$C_6H_{12}O_2$, Isobutyl acetate**
22°C (I) (58)

| | |
|---|---|
| 0.0269 | 0.1060 |
| 0.0135 | 0.1177 |

**$C_6H_{12}O_2$, Ethyl butyrate**
22°C (I) (58)

| | |
|---|---|
| 0.0269 | 0.1078 |
| 0.0135 | 0.1200 |

**$C_6H_{12}O_2$, Propyl propionate**
15°C (I) (60)

| M/$l_s$ | γ (air) ±2% |
|---|---|
| 0.03125 | 54.45 |
| 0.0156 | 57.32 |
| 0.0078 | 62.85 |
| 0.0039 | 67.04 |
| 0.00195 | 69.99 |
| 0.000977 | 71.68 |

**$C_6H_{12}O_3$, Paraldehyde**
15°C (I) (60)

| | |
|---|---|
| 0.5 | 43.18 |
| 0.25 | 51.47 |
| 0.125 | 58.44 |
| 0.0625 | 63.78 |
| 0.03125 | 67.64 |
| 0.0156 | 70.17 |

**$C_6H_{14}O_6$, Mannitol**
15°C (I) (59)

| g/$l_s$ | Δγ (air) |
|---|---|
| 50 | 0.4±0.2 |
| 100 | 0.8±0.4 |

**$C_6H_{15}N$, Triethylamine** (35, 36)
For two layer system, *v.* (36)

**$C_6H_{15}N$, Dipropylamine; 20°C**

| (II) (18) M/$l_s$ | γ (air) ±*ca.* 2.0 |
|---|---|
| 0.5657 | 30.06 |
| 0.2828 | 38.13 |
| 0.1414 | 46.79 |
| 0.0707 | 53.40 |
| 0.03535 | 59.45 |
| 0.01767 | 65.66 |
| 0.008835 | 69.88 |
| 0.004417 | 71.03 |
| 0.0022085 | 72.80 |

**$C_7H_6O_3$, Salicylic acid; γ (air)** (I) 14.5°C (68)

**$C_7H_9N$, *p*-Toluidine; γ (air)** (I) 16°C (68)

**$C_7H_9NO_3$, Ammonium salicylate** (38)

**$C_7H_{12}O_4$, Diethyl malonate; 20°C**

| (II) (24) M | γ (air) ±*ca.* 2.0 |
|---|---|
| 0.134 | 43.69 |
| 0.0677 | 51.12 |
| 0.0339 | 56.71 |
| 0.0169 | 61.25 |
| 0.00846 | 64.83 |
| 0.00423 | 67.70 |
| 0.00212 | 69.75 |
| 0.00106 | 70.97 |
| 0.000528 | 71.71 |
| 0.000264 | 72.12 |
| 0.000132 | 72.40 |
| 0.0000659 | 72.45 |

For γ (air) (I) 17°C, *v.* (68).

**$C_7H_{14}O_2$, Heptylic acid** (III) (47)

| M/$l_s$ | γ (air) ±*ca.* 2.0 0°C | 10°C | 20°C |
|---|---|---|---|
| 0.0010 | 68.20 | 67.60 | 67.00 |
| 0.0038 | 54.81 | 54.25 | 53.84 |
| 0.0119 | 42.5 | 41.08 | 40.25 |
| | 40°C | 60°C | 80°C |
| 0.0010 | 65.45 | 63.30 | 61.12 |
| 0.0038 | 53.73 | 53.50 | 53.00 |
| 0.0119 | 39.50 | 39.00 | 38.90 |

*Continued on p. 470*

**$C_6H_{12}O_6$, Dextrose; for levulose, *v.* (5)**

| Wt. % | *t*, °C | Δγ (air) | Method | Lit. |
|---|---|---|---|---|
| 1.0 | 25 | 0.25±0.2 | (II) | (5) |
| 8.8 | 15 | 0.8 ±0.4 | (I) | (59) |
| 17.1 | 15 | 1.4 ±0.4 | (I) | (59) |

**$C_7H_{14}O_2$.**—(*Cont'd*)
20°C (II) (18)

| M | γ (air) ±*ca.* 2.0 |
|---|---|
| 0.000117 | 72.80 |
| 0.000235 | 72.37 |
| 0.000469 | 69.45 |
| 0.000938 | 65.46 |
| 0.00188 | 59.35 |
| 0.00376 | 53.36 |
| 0.00753 | 44.87 |
| 0.0151 | 35.75 |

**$C_8H_6O_3$**, Piperonal; γ (air) (I) 17°C (68)

**$C_8H_8O_3$**, Methyl salicylate; γ (air) (I) 16°C (68)

**$C_8H_{12}O_4$**, Diethyl fumarate; γ (air) 20°C (II) (24)

**$C_8H_{14}O_4$**, Diethyl succinate; γ (air) 20°C (II) (24)
For γ (air) (I) 18°C, *v.* (68).

**$C_8H_{14}O_6$**, Diethyl *d*-tartrate; γ (air) 20°C (II) (24)

**$C_8H_{18}O$**, Octyl alcohol
20°C (II) (18)

| M/g $H_2O$ Satd. | γ (air) ±*ca.* 2.0 |
|---|---|
| 2.5 | 41.79 |
| 1.25 | 50.48 |
| 0.625 | 58.64 |
| 0.3125 | 67.07 |
| 0.2347 | 69.00 |
| 0.15675 | 71.81 |
| 0.078375 | 72.80 |

**$C_8H_{20}ClN$**, Tetraethylammonium chloride
0°C (I, III) (47)

| M | Δγ (air) ±*ca.* 0.5 |
|---|---|
| 0.50 | −0.82 |
| 1.00 | −1.60 |

**$C_9H_9NO_3$**, Hippuric acid; γ (air) (I) 16.5°C (68)

**$C_9H_{11}NO$**, *p*-Acetotoluide; γ (air) (I) 16.5°C (68)

**$C_9H_{18}O_2$**, Pelargonic acid; γ (air) 20°C (II) (18)

**$C_{10}H_{13}NO_2$**, Phenacetin; γ (air) (I) 16°C (68)

**$C_{10}H_{14}O$**, Thymol; γ (air) (I) 18°C (68)

**$C_{10}H_{16}O$**, Camphor; γ (air) (I) 17°C (68)

**$C_{10}H_{16}O_4$**, Camphoric acid; γ (air) (I) 16°C (68)

**$C_{10}H_{20}O$**, Menthol; γ (air) (I) 15°C (68)

**$C_{10}H_{20}O_2$**, Decylic acid (18) *v.* p. 474 for effect of time on γ

**$C_{12}H_{22}O_{11}$**, Sucrose
15–40°C (I, II, V) (5, 42, 44, 55, 59)

| Wt. % | Δγ (air) |
|---|---|
| 10 | 0.55 ±0.2 |
| 20 | 1.0 ±0.2 |
| 30 | 1.4 ±0.3 |
| 40 | 2.1 ±0.4 |
| 55 | 3.7 ±0.5 |

**$C_{12}H_{22}O_{11}.H_2O$** Lactose (I) (59)
100 g hydrate per l solution gives Δγ (air) at 15°C = 0.9 ± 0.4

**$C_{12}H_{28}ClN$**, Tetrapropylammonium chloride
0°C (I, III) (47)

| M | Δγ (air) ±*ca.* 0.5 |
|---|---|
| 0.10 | − 3.62 |
| 0.30 | − 6.40 |
| 0.50 | − 8.15 |
| 1.00 | −10.55 |

## TWO OR MORE SOLUTES

Standard arrangement (*v.* Vol. III, p. viii)

### The B-Component Key-formula Does Not Begin with 16

#### $H_2O$

B = **HCl**; C = Dextrose (5); Levulose (5); C = $C_{10}H_{20}O_2$, Decylic acid (18); C = Dextrose; D = Levulose (5); C = Sucrose (5)

B = **$H_2SO_4$** C = $C_2H_5OH$ (7)

B = **$(NH_4)_2SO_4$**; C = $Al_2(SO_4)_3$ 15°C (I) (59); 0.110 Moles of $CBA_{24}$ per 1 soln. gives Δγ (air) = 0.94 ± 0.4

B = **$NH_4NO_3$**; C = $AgNO_3$
100°C (III) (48)

| M C | M B | Δγ (air) ±*ca.* 0.5 |
|---|---|---|
| ∞ | ∞ | (49.3) |
| 56.55 | 90.61 | 38.0 |
| 26.59 | 42.61 | 30.1 |
| 17.35 | 27.80 | 23.3 |
| 13.42 | 21.50 | 21.3 |
| 7.825 | 12.54 | 15.5 |
| 5.313 | 8.513 | 12.6 |
| 2.744 | 4.397 | 7.7 |

B = **$NH_4NO_3$**.—(*Continued*)

| M C | M B | Δγ (air) ±*ca.* 0.5 |
|---|---|---|
| 1.438 | 2.303 | 4.7 |
| 0.838 | 1.344 | 3.0 |

100°C (III) (48)

| M* | Δγ (air) ±*ca.* 0.5 |
|---|---|
| ∞ | (58.1) |
| 76.02 | 48.2 |
| 45.17 | 45.3 |
| 20.70 | 28.0 |
| 11.57 | 15.1 |
| 6.002 | 8.9 |
| 2.155 | 4.1 |
| 1.000 | 2.3 |
| 0.444 | 1.1 |

B = **$TlNO_3$**; C = $AgNO_3$, 90°C (III) (48)

| M* | Δγ (air) ±*ca.* 0.5 |
|---|---|
| ∞ | (69.45) |
| 252.37 | 64.65 |
| 102.84 | 56.55 |

B = **$TlNO_3$**.—(*Continued*)

| M* | Δγ (air) ±*ca.* 0.5 |
|---|---|
| 89.02 | 55.05 |
| 27.02 | 30.85 |
| 11.92 | 16.75 |
| 9.16 | 13.55 |
| 5.35 | 9.65 |
| 3.44 | 7.55 |
| 1.528 | 4.55 |
| 0.702 | 2.65 |
| 0.573 | 2.15 |
| 0.255 | 1.05 |

* M = Moles B/kg $H_2O$ = Moles C/kg $H_2O$.

B = **$Cr_2(SO_4)_3$**; C = $K_2SO_4$ (59)*
0.100 Moles $CBA_{24}$ per l of solution gives Δγ (air) = 0.68 ± 0.4

B = **$NiSO_4$**; C = $K_2SO_4$ (59)*
0.229 Moles $CBA_6$ per l of solution gives Δγ (air) = 0.90 ±0.4

B = **$Fe_2(SO_4)_3$**; C = $K_2SO_4$ (59)*
0.099 Moles $CBA_{24}$ per l of solution gives Δγ (air) = 0.76 ± 0.4

B = **$ZnSO_4$**; C = $K_2SO_4$ (59)*
0.225 Moles $CBA_6$ per l of solution gives Δγ (air) = 1.17 ± 0.4

B = **$NaC_2H_3O_2$**, Acetate; C = $KC_2H_3O_2$, Acetate (38)

*By method (I) at 15°C.

#### Aqueous Solutions of Salt Mixtures

The surface tensions of certain salt mixtures listed below are additive (*i.e.*, $\gamma = u_1\gamma_1 + u_2\gamma_2 + \cdots + u_n\gamma_n$) within the limits of *precision* (±0.1 dyne/cm); γ is the surface tension of a mixture of two or more solutions; $u_n$ is the volume fraction of solution, *n*, in the mixture; $\gamma_n$ is the surface tension of solution, *n* (52, 64).

$N_{max.}$ = maximum concentrations studied, in terms of the total number of equivalents of salts to 100 Moles water.

| | $N_{max.}$ | | $N_{max.}$ |
|---|---|---|---|
| NaCl + KCl | 3.4 | KCl + $Na_2SO_4$ | 1.7 |
| $Na_2SO_4$ + $K_2SO_4$ | 1.3 | KCl + $K_2SO_4$ | 1.9 |
| NaCl + $Na_2SO_4$ | 2.2 | NaCl + $Na_2SO_4$ + KCl + $K_2SO_4$ | 1.7 |
| NaCl + $K_2SO_4$ | 2.3 | | |

### The B-Component Key-formula Begins with 16

The C-arrangement

B = **$CH_4O$**, Methyl alcohol; C = Ethyl bromide, Ethyl iodide, Propyl iodide, Allyl iodide, Ethylene chloride, Ethylene bromide, Ethylidene chloride, Chloroform, Carbon tetrachloride, Tetrachloroethylene, Benzene, Toluene, Aniline, *o*-Toluidine, *p*-Toluidine, Phenol, Resorcinol, Hydroquinol, Nitrobenzene, *o*-Nitrotoluene, *p*-Nitrotoluene (59).

B = **$NH_4CHO_2$**, Formate; C = $NaC_7H_5O_3$, Salicylate (38)

B = **$C_2H_6O$**, Ethyl alcohol; C = Glycerol (7); Benzene (64); Phenol (59, 64); Aniline (59, 64)

B = **$C_4H_8O_2$**, Isobutyric acid; C = $C_5H_{10}O_2$, Isovaleric acid (56); C = $C_6H_{12}O_2$, Isocaproic acid, (56)

B = **$C_5H_{10}O_2$**, Isovaleric acid; C = $BaC_{10}H_{18}O_4$, Isovalerate (56)

B = **$C_6H_7N$**, Aniline; C = NaCl (65)

B = **$C_6H_{12}O_6$**, Dextrose; C = Levulose (5)

B = **$NH_4C_7H_5O_3$**, Salicylate; C = $KCHO_2$, Formate (38)

B = **$C_{12}H_{22}O_{11}$**, Sucrose; C = NaOH, NaI, $Na_2SO_4$, $NaHCO_3$ (5)

## NON-AQUEOUS SOLUTIONS

### One Solute

#### Inorganic Substances in Organic Solvents

##### $CH_4O$

Methyl alcohol
B = $I_2$

1.00 Mole $I_2$ per l of solution in $CH_3OH$ at 25.6°C in air (III) gives Δγ = 0.86 ± *ca.* 0.2 (6)

##### $C_2H_6O$

Ethyl alcohol (4)
B = **NaBr**
17–20°C (I)

| Mol B/$l_s$ | Δγ (air) ±0.3 |
|---|---|
| 0.02 | 0.16 |
| 0.04 | 0.37 |

B = **NaBr.**—(*Continued*)

| Mol B/$l_s$ | Δγ (air) ±0.3 |
|---|---|
| 0.07 | 0.51 |
| 0.12 | 0.69 |

B = **NaI**

| | |
|---|---|
| 0.03 | 0.44 |
| 0.06 | 0.56 |
| 0.39 | 1.01 |
| 0.94 | 1.54 |

B = **$KC_2H_3O_2$**, Acetate

| | |
|---|---|
| 0.13 | 0.45 |
| 0.31 | 0.52 |
| 0.94 | 0.78 |
| 1.26 | 0.96 |

## Mixtures of Two Organic Compounds

### $CCl_4$

B = $CHCl_3$, 18°C (III) (64)

| M % B | γ (air) ±0.2 |
|---|---|
| 0 | 27.00 |
| 20 | 26.93 |
| 40 | 26.92 |
| 50 | 26.92 |
| 60 | 26.94 |
| 80 | 27.09 |
| 100 | 27.33 |

B = $C_2H_4O_2$, Acetic acid, 18°C (III) (64)

| M % A | γ (air) ±0.3 |
|---|---|
| 0 | 28.08 |
| 20 | 26.70 |
| 40 | 26.29 |
| 50 | 26.26 |
| 60 | 26.28 |
| 80 | 26.52 |
| 100 | 27.05 |

B = $C_2H_5I$, Ethyl iodide (67)

B = $C_4H_8O_2$, Ethyl acetate (67)

B = $C_6H_6$, Benzene (I) (45)

| t, °C | γ ±0.2 |
|---|---|
| $x_B = 0$ | |
| 11.8 | 27.98 |
| 46.0 | 23.70 |
| 78.0 | 19.93 |
| $x_B = 10/27$ | |
| 13.2 | 28.63 |
| 46.6 | 24.33 |
| 78.4 | 20.20 |
| $x_B = 1/2$ | |
| 16.0 | 28.67 |
| 46.2 | 24.32 |
| 78.2 | 20.40 |
| $x_B = 2/3$ | |
| 10.8 | 29.55 |
| 46.2 | 24.83 |
| 78.2 | 20.70 |
| $x_B = 1$ | |
| 11.2 | 30.23 |
| 46.0 | 25.57 |
| 78.0 | 21.42 |

### $CS_2$

B = $CHCl_3$, 18°C (III) (64)

| Wt. % B | γ (air) ±0.5 |
|---|---|
| 0 | 32.24 |
| 20 | 30.59 |
| 40 | 29.52 |
| 60 | 28.42 |
| 80 | 27.78 |
| 100 | 27.33 |

| Wt. % B | 13.0°C | 46.4°C | 61.2°C |
|---|---|---|---|
| | γ ±0.4 (I) (46) | | |
| 0.00 | 33.40 | 28.47 | 26.31 |
| 19.81 | 31.27 | 26.83 | 24.85 |
| 40.14 | 30.10 | 25.62 | 23.66 |
| 60.34 | 29.12 | 24.79 | 22.81 |
| 80.32 | 28.45 | 24.19 | 22.30 |
| 100.00 | 28.18 | 23.84 | 21.90 |

B = $CH_4O$, Methyl alcohol, *v.* (64)

B = $C_2H_4Cl_2$, Ethylene chloride, 18°C (III) (64)

| M % B | γ (air) ±0.4 |
|---|---|
| 0 | 32.24 |
| 20 | 30.89 |
| 40 | 30.64 |
| 50 | 30.63 |
| 60 | 31.06 |
| 80 | 31.56 |
| 100 | 32.66 |

B = $C_3H_6O$, Acetone (I) (66)

| t, °C | γ (air) ±0.3 |
|---|---|
| Wt. % B = 0.00 | |
| 14.0 | 33.19 |
| 28.5 | 31.06 |
| 44.0 | 28.76 |
| Wt. % B = 13.57 | |
| 16.0 | 27.71 |
| 38.0 | 25.44 |
| Wt. % B = 34.23 | |
| 15.0 | 25.86 |
| 29.5 | 24.10 |
| 39.0 | 22.84 |
| Wt. % B = 71.53 | |
| 18.0 | 24.21 |
| 38.0 | 21.67 |
| Wt. % B = 100.00 | |
| 14.4 | 24.33 |
| 35.0 | 21.91 |
| 53.0 | 19.53 |

B = $C_4H_{10}O$, Ethyl ether, 18°C (III) (64)

| Wt. % B | γ (air) ±0.5 |
|---|---|
| 0 | 32.24 |
| 20 | 25.35 |
| 40 | 21.87 |
| 60 | 20.46 |
| 80 | 18.68 |
| 100 | 17.47 |
| 25°C (III) (31) | |
| Wt. % B | γ (air) ±1.0 |
| 0.00 | 32.39 |
| 13.10 | 27.11 |
| 34.37 | 22.63 |
| 62.76 | 19.30 |
| 100.00 | 16.92 |

B = $C_6H_6$, Benzene, 18°C (III) (64)

| Wt. % A | γ (air) ±0.4 |
|---|---|
| 0 | 28.98 |
| 20 | 29.13 |
| 40 | 29.36 |
| 60 | 29.79 |
| 80 | 30.66 |
| 100 | 32.24 |

B = $C_7H_8$, Toluene, 25°C (III) (31)

| Wt. % B | γ (air) ±1.0 |
|---|---|
| 0.00 | 32.29 |
| 7.27 | 31.91 |
| 37.99 | 30.17 |
| 63.24 | 28.93 |
| 100.00 | 27.68 |

### $CHCl_3$

B = $C_2H_4O_2$, Acetic acid, 18°C (III) (64)

| M % A | γ (air) ±0.2 |
|---|---|
| 0 | 28.00 |
| 20 | 26.98 |
| 40 | 26.62 |
| 50 | 26.67 |
| 60 | 26.70 |
| 80 | 26.95 |
| 100 | 27.40 |

B = $C_2H_6O$, Ethyl alcohol (I) (46)

| Wt. % B | 10.0°C | 46.2°C | 78.2°C |
|---|---|---|---|
| | γ ±0.4 | | |
| 0 | 28.58 | 23.75 | 19.68 |
| 20 | 26.58 | 22.39 | 18.65 |
| 40 | 25.40 | 21.63 | 18.21 |
| 60 | 24.58 | 21.10 | 17.98 |
| 80 | 23.95 | 20.76 | 17.82 |
| 100 | 23.61 | 20.47 | 17.67 |

B = $C_3H_6O$, Acetone, 18°C (III) (64)

| M % A | γ (air) ±0.2 |
|---|---|
| 0 | 23.76 |
| 20 | 24.38 |
| 40 | 25.23 |
| 60 | 25.98 |
| 80 | 26.72 |
| 100 | 27.33 |

B = $C_4H_{10}O$, Ethyl ether, 18°C (III) (64)

| Wt. % B | γ (air) ±0.3 |
|---|---|
| 0 | 27.33 |
| 20 | 23.94 |
| 40 | 21.82 |
| 60 | 19.88 |
| 80 | 18.54 |
| 100 | 17.46 |

B = $C_6H_6$, Benzene, 18°C (III) (64)

| Wt. % A | γ (air) ±0.2 |
|---|---|
| 0 | 28.94 |
| 20 | 28.57 |
| 40 | 28.11 |
| 60 | 27.78 |
| 80 | 27.59 |
| 100 | 27.33 |

B = $C_8H_{20}BrN$, Tetraethylammonium bromide (I) (63)

| t, °C | γ(?) ±0.3 |
|---|---|
| Wt. % B = 0 | |
| 15.9 | 27.71 |
| 37.0 | 24.79 |
| Wt. % B = 6.12 | |
| 25.0 | 26.81 |
| 34.4 | 25.66 |
| 54.0 | 23.31 |
| Wt. % B = 7.48 | |
| 20.5 | 27.58 |
| 40.9 | 25.10 |
| 50.6 | 23.92 |

### $CH_2O_2$

Formic acid

B = $C_4H_6O_2$, Acetic acid (28)

### $CH_4O$

Methyl alcohol

B = $C_2H_5I$, Ethyl iodide (67)

B = $C_2H_6O$, Ethyl alcohol (II) (40)

| Wt. % A | 0°C | 30°C | 50°C |
|---|---|---|---|
| | γ (air) ±0.3 | | |
| 0.00 | 23.91 | 21.49 | 19.88 |
| 50.45 | 24.23 | 21.65 | 19.91 |
| 100.00 | 24.48 | 21.80 | 20.13 |

B = $C_3H_6O$, Acetone (II) (40)

| Wt. % A | 0°C | 30°C |
|---|---|---|
| | γ (air) ±0.2 | |
| 0.00 | 26.08 | 22.34 |
| 33.25 | 25.98 | 22.55 |
| 39.88 | 25.89 | 22.52 |
| 49.84 | 25.76 | 22.46 |
| 59.83 | 25.55 | |
| 100.00 | 24.48 | 21.81 |

B = $C_3H_8O$, *n*-Propyl alcohol (28)

B = $C_6H_6$, (II) (40)

| Wt. % A | 0°C | 30°C |
|---|---|---|
| | γ (air) ±0.3 | |
| 0.00 | 31.55 | 27.57 |
| 15.04 | | 26.08 |
| 19.94 | 29.12 | |
| 20.06 | | 25.68 |
| 25.00 | 28.74 | |
| 25.10 | | 25.38 |
| 30.07 | 28.40 | |
| 30.13 | | 25.09 |
| 50.04 | | 24.09 |
| 70.07 | 26.10 | |
| 75.15 | | 22.91 |
| 100.00 | 24.48 | 21.80 |

### $C_2H_4Br_2$

Ethylene bromide

B = $C_2H_4O_2$, Acetic acid (I) (46)

| Wt. % A | 14°C | 46°C | 78°C | 132°C |
|---|---|---|---|---|
| | γ ±0.7 | | | |
| 0.0 | 27.67 | 24.73 | 21.81 | 16.70 |
| 14.4 | 28.53 | 24.83 | 21.68 | 16.94 |
| 27.8 | 29.15 | 25.17 | 21.90 | 16.83 |
| 49.4 | 29.84 | 26.27 | 22.94 | 17.69 |
| 69.4 | 31.22 | 27.58 | 24.20 | 18.63 |
| 86.6 | 32.75 | 29.29 | 25.90 | 20.49 |
| 93.6 | 32.94 | 30.28 | 28.16 | 22.71 |
| 100.0 | 40.02 | 35.66 | 31.31 | 24.50 |

B = $C_3H_6Br_2$, 1, 2-Dibromopropane (67)

B = $C_6H_5Cl$, Chlorobenzene (I) (45, 46)

| Wt. % B | 13°C | 46°C | 78°C | 132°C |
|---|---|---|---|---|
| | γ ± 0.5 | | | |
| 0.00 | 40.16 | 35.66 | 31.31 | 24.50 |
| 20.12 | 36.75 | 32.54 | 28.69 | 22.57 |
| 39.46 | 35.77 | 31.51 | 27.59 | 21.41 |
| 60.35 | 35.49 | 31.29 | 27.41 | 21.16 |
| 79.95 | 34.29 | 30.17 | 26.37 | 20.31 |
| 100.00 | 34.43 | 30.37 | 26.60 | 20.53 |

### $C_2H_4Cl_2$
Ethylene chloride

B = $C_6H_6$, Benzene (I) (66)

| $t$, °C | γ (air) ±0.3 |
|---|---|
| Wt. % A = 0.00 | |
| 14.0 | 29.65 |
| 45.0 | 25.63 |
| 70.0 | 22.40 |
| Wt. % A = 26.24 | |
| 14.0 | 30.00 |
| 50.0 | 25.53 |
| Wt. % A = 48.68 | |
| 14.5 | 30.39 |
| 45.0 | 26.56 |
| 70.0 | 23.45 |
| Wt. % A = 68.10 | |
| 15.0 | 31.04 |
| 41.0 | 27.71 |
| 58.0 | 25.52 |
| Wt. % A = 100.00 | |
| 12.5 | 33.08 |
| 43.0 | 28.91 |

### $C_2H_4O_2$
Acetic acid

B = $C_2H_5I$, Ethyl iodide, 18°C (III) (64)

| M % B | γ (air) ±1.0 |
|---|---|
| 0 | 28.08 |
| 20 | 26.71 |
| 40 | 26.69 |
| 50 | 26.83 |
| 60 | 27.02 |
| 80 | 27.66 |
| 100 | 28.83 |

B = $C_6H_5N$, Pyridine (I) (66)

| $t$, °C | γ (air) ±1.0 |
|---|---|
| Wt. % A = 0.00 | |
| 13.0 | 39.39 |
| 49.0 | 34.14 |
| 80.0 | 29.37 |
| Wt. % A = 26.28 | |
| 17.0 | 37.66 |
| 52.0 | 33.17 |
| 76.0 | 29.90 |
| Wt. % A = 47.67 | |
| 12.0 | 36.88 |
| 47.0 | 33.05 |
| 75.0 | 29.83 |
| Wt. % A = 71.39 | |
| 14.0 | 34.50 |
| 49.0 | 30.92 |
| 75.0 | 28.24 |
| Wt. % A = 100.00 | |
| 14.5 | 28.19 |
| 52.0 | 24.48 |
| 75.0 | 22.08 |

B = $C_6H_6$
30°C (II) (40)

| Wt. % A | γ (air) ±0.2 |
|---|---|
| 0.00 | 27.56 |
| 25.10 | 26.52 |
| 49.77 | 25.98 |
| 61.48 | 25.85 |
| 75.42 | 25.93 |
| 100.00 | 26.61 |

B = $C_6H_6$.—(*Continued*)
18°C (III) (64)

| Wt. % A | γ (air) ±0.3 |
|---|---|
| 0.00 | 28.94 |
| 34.07 | 27.89 |
| 53.57 | 27.53 |
| 75.47 | 27.52 |
| 100.00 | 28.00 |

15°C (II) (40)

| Wt. % A | γ (air) ±0.2 |
|---|---|
| 0.00 | 29.55 |
| 55.13 | 27.79 |
| 60.40 | 27.66 |
| 65.20 | 27.65 |
| 100.00 | 28.13 |

B = $C_7H_8$, Toluene (I) (46)

| Wt. % B | 15.0°C | 45.9°C | 78.0°C | 131.6°C |
|---|---|---|---|---|
| | γ ±0.7 | | | |
| 0.00 | 27.57 | 24.74 | 21.75 | 16.73 |
| 20.08 | 27.55 | 24.22 | 20.83 | 15.59 |
| 40.32 | 27.55 | 24.11 | 20.66 | 15.30 |
| 60.02 | 27.88 | 24.32 | 20.75 | 15.32 |
| 75.20 | 28.36 | 24.66 | 21.03 | 15.40 |
| 87.83 | 28.57 | 24.88 | 21.23 | 15.58 |
| 100.00 | 29.21 | 24.48 | 21.81 | 16.17 |

### $C_2H_5I$
Ethyl iodide

B = $C_4H_8O_2$, Ethyl acetate (67)

B = $C_4H_{10}O$, Ethyl ether, 25°C (III) (31)

| Wt. % B | γ (air) ±1.0 |
|---|---|
| 0.00 | 30.52 |
| 37.20 | 21.29 |
| 100.00 | 16.92 |

B = $C_6H_6$, 18°C (III) (64)

| M % A | γ (air) ±1.0 |
|---|---|
| 0 | 28.94 |
| 20 | 28.74 |
| 40 | 28.64 |
| 50 | 28.61 |
| 60 | 28.64 |
| 80 | 28.67 |
| 100 | 28.83 |

### $C_2H_6O$
Ethyl alcohol

B = $C_3H_6O$, Acetone (II) (40)

| Wt. % A | 0°C | 20°C | 45°C |
|---|---|---|---|
| | γ (air) ±0.3 | | |
| 0.00 | 26.09 | 23.58 | 20.48 |
| 20.03 | | 23.40 | |
| 40.06 | | 23.20 | |
| 50.00 | 25.16 | 23.09 | 20.54 |
| 79.70 | | 22.69 | |
| 100.00 | 23.91 | 22.30 | 20.28 |

B = $C_6H_6$ (II) (40)

| Wt. % A | 25°C γ (air) ±0.2 | Wt. % A | 45°C γ (air) ±0.2 |
|---|---|---|---|
| 0.00 | 28.23 | 0.00 | 25.61 |
| 20.04 | 26.17 | 19.96 | 23.94 |
| 50.06 | 24.49 | 25.00 | 23.67 |
| 75.04 | 23.19 | 29.83 | 23.43 |
| 100.00 | 21.89 | 100.00 | 20.28 |

B = $C_6H_6$.—(*Continued*)
(I) (46)

| Wt. % A | 10°C | 46.2°C | 78.2°C |
|---|---|---|---|
| | γ ±0.3 | | |
| 0.00 | 30.39 | 25.53 | 21.40 |
| 20.17 | 27.91 | 23.75 | 20.11 |
| 37.14 | 26.91 | 23.01 | 19.60 |
| 57.88 | 25.82 | 22.18 | 18.96 |
| 74.51 | 24.92 | 21.51 | 18.44 |
| 84.16 | 24.43 | 21.10 | 18.14 |
| 100.00 | 23.61 | 20.47 | 17.67 |

B = $C_6H_6O$, Phenol (II) (40)

| Wt. % A | 0°C γ (air) ±0.4 | 35°C γ (air) ±0.3 |
|---|---|---|
| 0.00 | 42.99 | 39.28 |
| 25.39 | | 33.23 |
| 49.44 | | 28.11 |
| 50.20 | 31.28 | |
| 59.73 | 29.52 | |
| 74.60 | 27.10 | 24.01 |
| 100.00 | 23.91 | 21.09 |

### $C_3H_6O$
Acetone

B = $C_5H_{10}O_2$, Propyl acetate, 15°C (II) (37)

| Wt. % A | γ (air) ±0.2 |
|---|---|
| 0.00 | 24.94 |
| 49.70 | 24.47 |
| 100.00 | 24.16 |

B = $C_6H_5Cl$, Chlorobenzene, 15°C (II) (37)

| Wt. % B | γ (air) ±0.2 |
|---|---|
| 0.00 | 24.16 |
| 50.25 | 27.50 |
| 100.00 | 33.88 |

B = $C_6H_6$
15°C (II) (37)

| Wt. % B | γ (air) ±0.2 |
|---|---|
| 0.00 | 24.16 |
| 45.22 | 26.59 |
| 100.00 | 29.55 |
| 18.2°C (III) (64) | |
| Wt. % B | γ (air) ±0.3 |
| 0 | 23.72 |
| 20 | 24.65 |
| 40 | 25.60 |
| 50 | 26.18 |
| 60 | 26.77 |
| 80 | 27.76 |
| 100 | 28.94 |

B = $C_6H_6O$, Phenol (II) (40)

| Wt. % A | 0°C γ (air) ±0.4 | 35°C γ (air) ±0.2 |
|---|---|---|
| 0.00 | 42.99 | 39.28 |
| 38.47 | | 31.53 |
| 60.0 | 31.28 | 27.07 |
| 70.78 | 29.47 | |
| 100.00 | 26.06 | 21.70 |

### $C_3H_6O_2$
Ethyl formate

B = $C_7H_8$, Toluene (II) (37)

| Wt. % B | 15°C γ (air) ±02 | 40°C |
|---|---|---|
| 0.00 | 24.34 | 21.21 |
| 27.33 | 25.33 | 22.24 |
| 51.13 | 26.28 | 23.27 |
| 82.02 | 27.94 | 24.97 |
| 100.00 | 29.12 | 26.19 |

### $C_3H_6O_2$
Methyl acetate

B = $C_4H_8O_2$, Ethyl acetate (28)

### $C_3H_8O$
*n*-Propyl alcohol

B = $C_6H_7N$, Aniline (28)

### $C_3H_8O_2$
Methylal

B = $C_6H_{12}O_2$, Isobutyl acetate, 18°C (III) (64)

| M % B | γ (air) ±0.5 |
|---|---|
| 0 | 21.43 |
| 20 | 22.13 |
| 40 | 22.72 |
| 50 | 22.95 |
| 60 | 23.20 |
| 80 | 23.66 |
| 100 | 24.04 |

### $C_4H_5Cl_3O_2$
Ethyl trichloroacetate

B = $C_4H_8O_2$, Ethyl acetate (28)

### $C_4H_8O_2$
Ethyl acetate

B = $C_5H_{12}O$, Isoamyl alcohol, 18°C (III) (64)

| M % B | γ (air) ±0.3 |
|---|---|
| 0 | 24.22 |
| 20 | 24.19 |
| 40 | 24.17 |
| 50 | 24.16 |
| 60 | 24.13 |
| 80 | 24.15 |
| 100 | 24.29 |

B = $C_6H_5NO_2$, Nitrobenzene, 20°C (I) (21)

| Wt. % A | γ ±*ca.* 0.7 |
|---|---|
| 0.00 | 43.21 |
| 15.00 | 36.61 |
| 29.24 | 32.58 |
| 36.57 | 31.35 |
| 55.55 | 28.31 |
| 79.89 | 25.47 |
| 92.02 | 24.81 |
| 100.00 | 23.67 |

B = $C_6H_6$, 20°C (I) (21)

| Wt. % A | γ ±*ca.* 0.7 |
|---|---|
| 0.00 | 29.03 |
| 20.90 | 27.69 |
| 39.96 | 26.54 |
| 60.33 | 25.37 |
| 80.40 | 24.57 |
| 100.00 | 23.72 |

B = $C_7H_{14}O_2$, *n*-Amyl acetate (28)

B = $C_8H_{11}N$, Dimethylaniline, 20°C (I) (21)

| Wt. % B | γ ±*ca.* 0.7 |
|---|---|
| 0.00 | 23.67 |
| 18.43 | 25.37 |
| 39.89 | 26.87 |
| 50.08 | 28.69 |
| 77.32 | 31.41 |
| 100.00 | 36.51 |

B = $C_8H_{14}O_4$, Diethyl succinate (28)

B = $C_9H_{10}O_2$, Ethyl benzoate (28)

B = $C_{10}H_{22}O$, Isoamyl ether (28)

## $C_4H_8O_2$

Methyl propionate

B = $C_7H_8$, Toluene (II) (37)

| Wt. % B | 15°C | 40°C |
|---|---|---|
| | γ (air) ±0.2 | |
| 0.00 | 25.52 | 22.46 |
| 32.67 | 26.65 | 23.52 |
| 46.20 | 27.08 | 24.05 |
| 74.99 | 28.17 | 25.13 |
| 100.00 | 29.12 | 26.19 |

B = $C_{14}H_{20}O_2$, Amyl hydrocinnamate (II) (37)

| Wt. % B | 15°C | 40°C |
|---|---|---|
| | γ (air) ±0.2 | |
| 0.00 | 25.52 | 22.46 |
| 51.52 | 28.21 | 25.38 |
| 100.00 | 32.45 | 30.30 |

## $C_4H_{10}O$

Ethyl ether

B = $C_6H_6$, 18°C (III) (64)

| Wt. % A | γ (air) ±0.3 |
|---|---|
| 0 | 28.94 |
| 20 | 25.43 |
| 40 | 22.82 |
| 50 | 21.72 |
| 60 | 20.67 |
| 80 | 18.99 |
| 100 | 17.44 |

25°C (III) (31)

| Wt. % A | γ (air) ±0.5 |
|---|---|
| 0.00 | 28.25 |
| 24.31 | 24.26 |
| 43.08 | 21.76 |
| 71.42 | 18.24 |
| 100.00 | 16.92 |

## $C_5H_{10}O_2$

Ethyl propionate

B = $C_6H_5Cl$, Chlorobenzene, 10°C (II) (37)

| Wt. % B | γ (air) ±0.2 |
|---|---|
| 0.00 | 25.34 |
| 50.25 | 29.95 |
| 100.00 | 34.52 |

B = $C_6H_6$, 10°C (II) (37)

| Wt. % B | γ (air) ±0.2 |
|---|---|
| 0.00 | 25.34 |
| 42.93 | 27.35 |
| 54.55 | 27.89 |
| 100.00 | 30.21 |

B = $C_7H_8$, Toluene, 10°C (II) (37)

| | |
|---|---|
| 0.00 | 25.34 |
| 51.87 | 27.58 |
| 100.00 | 29.70 |

## $C_5H_{10}O_2$

Methyl *n*-butyrate

B = $C_6H_5Cl$, Chlorobenzene (II) (37)

| Wt. % B | 15°C | 40°C |
|---|---|---|
| | γ (air) ±0.2 | |
| 0.00 | 25.55 | 22.68 |
| 53.51 | 29.13 | 26.18 |
| 100.00 | 33.88 | 30.77 |

B = $C_6H_6$ (II) (37)

| Wt. % B | 15°C | 40°C |
|---|---|---|
| | γ (air) ±0.2 | |
| 0.00 | 25.55 | 22.68 |
| 33.62 | 26.83 | 23.81 |
| 50.77 | 27.49 | 24.38 |
| 77.25 | 28.65 | 25.39 |
| 100.00 | 29.54 | 26.26 |

## $C_5H_{10}O_2$

Propyl acetate

B = $C_5H_{10}O_3$, Ethyl lactate (II) (37)

| Wt. % B | 15°C | 40°C |
|---|---|---|
| | γ (air) ±0.2 | |
| 0.00 | 24.94 | 22.10 |
| 28.68 | 26.09 | 23.27 |
| 51.59 | 27.13 | 24.36 |
| 78.83 | 28.77 | 26.09 |
| 100.00 | 30.50 | 27.92 |

B = $C_6H_6$ (II) (37)

| | | |
|---|---|---|
| 0.00 | 24.94 | 22.10 |
| 54.97 | 27.32 | 24.23 |
| 100.00 | 29.54 | 26.26 |

B = $C_6H_{12}O_2$, Amyl formate (28)

## $C_5H_{11}N$

Piperidine

B = $C_7H_8$, Toluene (I) (45)

| *t*, °C | γ ±0.3 |
|---|---|
| $x_B = 0$ | |
| 15.2 | 30.71 |
| 46.6 | 27.13 |
| 78.4 | 23.25 |
| 132.5 | 17.31 |
| $x_B = \frac{1}{6}$ | |
| 14.9 | 30.49 |
| 46.6 | 26.64 |
| 78.4 | 22.95 |
| 132.5 | 17.06 |

B = $C_7H_8$.—(*Continued*)

| *t*, °C | γ ±0.3 |
|---|---|
| $x_B = \frac{5}{6}$ | |
| 14.5 | 29.63 |
| 46.6 | 25.75 |
| 78.4 | 22.29 |
| 132.5 | 16.37 |
| $x_B = 1$ | |
| 15.2 | 29.17 |
| 46.6 | 25.46 |
| 78.4 | 21.66 |
| 132.5 | 16.07 |

## $C_6H_5Br$

Bromobenzene

B = $C_6H_6Cl$, Chlorobenzene (28)

B = $C_7H_8$, Toluene (67)

## $C_6H_5Cl$

Chlorobenzene

B = $C_6H_6$ (II) (37)

| Wt. % B | 10°C | 40°C |
|---|---|---|
| | γ (air) ±0.2 | |
| 0.00 | 34.52 | 30.77 |
| 30.18 | 32.81 | 28.99 |
| 44.54 | | 28.24 |
| 46.94 | 32.09 | |
| 71.19 | 31.19 | |
| 72.67 | | 27.09 |
| 100.00 | 30.21 | 26.26 |

B = $C_7H_8$, Toluene (II) (37)

| | | |
|---|---|---|
| 0.0 | 34.52 | 30.77 |
| 21.99 | 33.14 | 29.54 |
| 51.08 | 31.62 | 27.99 |
| 77.30 | 30.57 | 26.95 |
| 100.00 | 29.70 | 26.19 |

## $C_6H_5NO_2$

Nitrobenzene

B = $C_6H_6$, 55°C (I) (21)

| Wt. % B | γ ±*ca.* 1.5 |
|---|---|
| 0.00 | 38.73 |
| 11.85 | 34.69 |
| 35.46 | 29.27 |
| 52.27 | 27.70 |
| 71.77 | 25.46 |
| 89.01 | 24.27 |
| 100.00 | 23.41 |

B = $C_7H_8$, Toluene, 55°C (I) (21)

| Wt. % A | γ ±*ca.* 1.5 |
|---|---|
| 0.00 | 23.42 |
| 31.62 | 25.74 |
| 71.48 | 30.67 |
| 91.70 | 35.52 |
| 100.00 | 37.91 |

B = $C_7H_9N$, Methylaniline (28)

B = $C_7H_9N$, *o*-Toluidine (28)

B = $C_8H_{11}N$, Dimethylaniline (28)

B = $C_8H_{11}N$, Ethylaniline (28)

B = $C_{10}H_{15}N$, Diethylaniline (28)

## $C_6H_6$

B = $C_6H_6O$, Phenol, 35°C (II) (40)

| Wt. % A | γ (air) ±0.2 |
|---|---|
| 0.00 | 39.28 |
| 24.86 | 33.63 |
| 35.18 | 32.11 |
| 50.11 | 30.43 |
| 100.00 | 26.91 |

B = $C_6H_7N$, Aniline, 20°C (I) (21)

| Wt. % A | γ ±*ca.* 1.5 |
|---|---|
| 0.00 | 44.11 |
| 11.41 | 39.61 |
| 33.35 | 35.31 |
| 88.60 | 29.66 |
| 100.00 | 29.03 |

B = $C_7H_8$, Toluene, 18°C (III) (64)

| M % A | γ (air) ±0.2 |
|---|---|
| 0 | 28.59 |
| 20 | 28.63 |
| 40 | 28.67 |
| 50 | 28.69 |
| 60 | 28.75 |
| 80 | 28.80 |
| 100 | 28.94 |

| Wt. % A | γ (air) ±0.2 |
|---|---|
| 10.8°C (II) (37) | |
| 0.00 | 29.61 |
| 24.98 | 29.76 |
| 50.07 | 29.85 |
| 75.06 | 30.02 |
| 100.00 | 30.11 |
| 40°C (II) (37) | |
| 0.00 | 26.19 |
| 24.99 | 26.11 |
| 47.69 | 26.12 |
| 74.98 | 26.15 |
| 100.00 | 26.26 |
| 25°C (III) (31) | |
| Wt. % A | γ (air) ±0.3 |
| 0.00 | 27.68 |
| 30.59 | 27.95 |
| 66.58 | 28.14 |
| 90.72 | 28.24 |
| 91.56 | 28.22 |
| 100.00 | 28.25 |

B = $C_7H_8O$, *m*-Cresol (28)

B = $C_8H_{10}$, *m*-Xylene (28)

B = $C_9H_{13}N$, Dimethyl-*o*-toluidine, 54.6°C (I) (21)

| Wt. % B | γ ±*ca.* 1.5 |
|---|---|
| 0.00 | 23.26 |
| 11.50 | 23.48 |
| 23.36 | 24.13 |
| 44.07 | 25.18 |
| 63.19 | 25.95 |
| 76.99 | 26.43 |
| 89.56 | 26.91 |
| 100.00 | 27.92 |

### $C_6H_6$—(*Continued*)

B = $C_{51}H_{98}O_6$, Tripalmitin (I) (62)

| *t*, °C | γ (air) ±0.3 |
|---|---|
| Wt. % B = 1.98 | |
| 39.8 | 26.31 |
| 32.2 | 27.28 |
| 27.4 | 27.95 |
| Wt. % B = 4.07 | |
| 50.3 | 24.93 |
| 40.4 | 26.16 |
| 36.5 | 26.71 |
| Wt. % B = 7.78 | |
| 48.9 | 25.01 |
| 39.3 | 26.32 |
| 29.3 | 27.59 |

B = $C_{57}H_{110}O_6$, Tristearin (I) (62)

| *t*, °C | γ (air) ±0.3 |
|---|---|
| Wt. % B = 2.08 | |
| 31.3 | 27.35 |
| 48.4 | 25.17 |
| 25.5 | 28.12 |

### $C_6H_7N$

Aniline

B = $C_7H_8$, Toluene, 20°C (I) (21)

| Wt. % B | γ ±*ca.* 1.5 |
|---|---|
| 0.00 | 44.13 |
| 19.16 | 36.89 |
| 39.93 | 33.50 |
| 59.05 | 31.47 |
| 74.57 | 30.12 |
| 100.00 | 28.68 |

B = $C_7H_9N$, *o*-Toluidine, 54°C (I) (21)

| Wt. % A | γ ±*ca.* 0.5 |
|---|---|
| 0.00 | 35.78 |
| 16.33 | 35.94 |
| 39.91 | 36.69 |
| 60.53 | 37.28 |
| 82.89 | 37.84 |
| 91.67 | 38.21 |
| 100.00 | 38.50 |

B = $C_8H_{11}N$, Dimethylaniline, 54.7°C (I) (21)

| Wt. % B | γ ±*ca.* 0.5 |
|---|---|
| 0.00 | 38.50 |
| 19.59 | 37.00 |
| 46.08 | 35.52 |
| 64.42 | 34.43 |
| 82.60 | 33.33 |
| 100.00 | 32.25 |

### $C_7H_8$

Toluene

B = $C_7H_8O$, *m*-Cresol (28)

B = $C_7H_9N$, *o*-Toluidine, 54.5°C (I) (21)

| Wt. % A | γ ±*ca.* 1.0 |
|---|---|
| 0.00 | 35.78 |
| 17.69 | 31.51 |
| 58.59 | 26.46 |
| 88.84 | 24.59 |
| 100.00 | 23.45 |

B = $C_8H_{11}N$, Dimethylaniline, 20°C (I) (21)

| Wt. % A | γ ±*ca.* 0.5 |
|---|---|
| 0.00 | 36.51 |
| 12.95 | 34.88 |
| 20.86 | 33.90 |
| 39.81 | 32.10 |
| 59.53 | 30.78 |
| 79.24 | 29.65 |
| 100.00 | 28.68 |

B = $C_9H_{10}O_2$, Ethyl benzoate, 25°C (III) (31)

| Wt. % A | γ (air) ±0.5 |
|---|---|
| 0.00 | 35.26 |
| 15.28 | 33.58 |
| 47.32 | 30.37 |
| 76.17 | 28.92 |
| 100.0 | 27.68 |

B = $C_9H_{13}N$, Dimethyl-*o*-toluidine, 54.6°C (I) (21)

| Wt. % B | γ ±*ca.* 1.5 |
|---|---|
| 0.00 | 23.50 |
| 28.44 | 24.53 |
| 53.30 | 25.39 |
| 60.12 | 25.92 |
| 80.22 | 26.71 |
| 100.00 | 27.92 |

### $C_7H_8O$

*m*-Cresol

B = $C_7H_9N$, *o*-Toluidine (28)

B = $C_8H_{11}N$, Dimethylaniline (28)

### $C_8H_{10}$

*o*-Xylene

B = $C_8H_{10}$, *m*-Xylene (28)

B = $C_8H_{10}$, *p*-Xylene (28)

### $C_8H_{10}$

*m*-Xylene

B = $C_8H_{10}$, *p*-Xylene (28)

B = $C_8H_{11}N$, Dimethylaniline (28)

### Two or More Solutes

$I_2 + CH_3OH + KI$ (6).

A = $SiO_2$; B = CaO; C = $Na_2O$, *v.* Vol. II, p. 96.

A = $CHCl_3$; B = $C_3H_6O$, Acetone; C = $C_6H_6$ (64).

A = $C_2H_4O_2$, Acetic acid; B = $C_2H_5I$; C = $C_6H_6$ (64).

A = $C_3H_6O$, Acetone; B = $C_6H_6$; C = $C_7H_8$ (37).

A = $C_4H_8O_2$, Methyl propionate; B = $C_6H_6$; C = $C_7H_8$ (37); B = $C_5H_{10}O_3$, Ethyl lactate; C = $C_6H_6$; D = $C_7H_8$ (37).

A = $C_5H_{10}O_2$, Ethyl propionate; B = $C_6H_6$; C = $C_7H_8$ (37); B = $C_6H_5Cl$; C = $C_6H_6$; D = $C_7H_8$ (37).

A = $C_5H_{10}O_2$, Methyl *n*-butyrate; B = $C_5H_{10}O_2$, Propyl acetate; C = $C_6H_6$; D = $C_7H_8$ (37); C = $C_4H_8O_2$, Methyl propionate; D = $C_6H_6$; E = $C_7H_8$ (37).

A = $C_6H_5Cl$; B = $C_6H_6$; C = $C_7H_8$ (37).

## VARIATION OF SURFACE TENSION WITH AGE OF SURFACE

From experiments on water with the method of the "vibrating jet," Bohr (3) concludes that the surface tension is constant after the surface is 0.06 second old, and that the method gives no evidence in favor of a change prior to this time.

Data, obtained by the capillary-height method, have been presented (23, 26, 53) in support of the idea of Lenard (30) that some pure liquids and salt solutions exhibit higher values of γ at periods of the order of 0.001 to 0.01 second after their formation, than the static or equilibrium value. The evidence of these elaborate experiments suffers from the defect that the variation of the thickness of the liquid film on the walls of the capillary with the time may be great enough to give rise to all of the variations observed, since the effective diameter of the tube of liquid is less at such time intervals than later.

The surface tension of an aqueous solution of a surface-active substance decreases with time, since the surface region contains at equilibrium a larger concentration of the solute than the phasal region. The rate of decrease depends upon the concentration of the solution and that of the surface region, and the diffusion coefficient of the solute.

VARIATION OF THE SURFACE TENSION OF AN AQUEOUS SOLUTION OF DECYLIC ACID (0.000064 MOLE PER L) WITH THE TIME ($t$ = 20°C) (18)

| Min | 0.0 | 0.5 | 1.0 | 5.0 | 8.0 | 30.0 |
|---|---|---|---|---|---|---|
| γ | (72.8)* | 65.7 | 62.0 | 58.2 | 57.6 | 56.0 |

* Assumed.

EFFECT OF TIME UPON THE INTERFACIAL TENSION OF BENZENE 0.001 MOLE PER L OF SODIUM OLEATE IN WATER AT 20°C (19)

| Min | 0.0 | 0.5 | 1.0 | 2.0 | 3.0 | 5.0 | 7.5 | 10.0 |
|---|---|---|---|---|---|---|---|---|
| γ | (35.0)* | 14.1 | 12.9 | 11.9 | 11.0 | 10.7 | 10.7 | 10.7 |

* Assumed.

## EFFECT OF NATURE OF THE GAS* AT THE INTERFACE¶

| Liquid | Gas | *t*, °C | $\frac{100(\gamma_G - \gamma_A)}{\gamma_A}$ | $\frac{100(\gamma_G - \gamma_V)}{\gamma_V}$ | Method | Lit. |
|---|---|---|---|---|---|---|
| $H_2O$ | Vap. | 20 | 0.035 | (0.0) | (I) | (49) |
| | Vap. | 20 | 0.2 | (0.0) | (I) | (57) |
| | $CO_2$ | 15 | −1.1 | | (III) | (11) |
| | $CO_2$ | 18 | | −0.83 | (I) | (57) |
| | $CO_2$ | 20 | −1.0 | | (V) | (55) |
| | $N_2O$ | 25.2 | | −0.85 | (I) | (57) |
| | $H_2S$ | 15.2 | | −1.29 | (I) | (57) |
| | $H_2$ | 20 | 0.0 | | (V) | (55) |
| | Various organic vapors | | | | (II) | (27) |
| $CCl_4$ | $CO_2$ | 25 | | −1.0 | (I) | (57) |
| $CS_2$ | $CO_2$ | 24.8 | | −1.0 | (I) | (57) |
| $CHCl_3$ | $CO_2$ | 17 | −2.1 | | (III) | (11) |
| $CH_3OH$ | $CO_2$ | 17 | −1.5 | | (III) | (11) |
| $C_2H_5OH$ | Vap. | 19 | 0.5 | | (I) | (57) |
| | $CO_2$ | 25.3 | | −1.0 | (I) | (57) |
| | $CO_2$ | 18 | −1.2 | | (III) | (11) |
| | $H_2S$ | 16.1 | | −1.3 | (I) | (57) |
| | $N_2O$ | 25.1 | | −1.0 | (I) | (57) |

| Liquid | Gas | $t$, °C | $\frac{100(\gamma_G - \gamma_A)}{\gamma_A}$ | $\frac{100(\gamma_G - \gamma_V)}{\gamma_V}$ | Method | Lit. |
|---|---|---|---|---|---|---|
| $(C_2H_5)_2O$ | Vap. | 20 | 0.3 | | (I) | (49) |
| | Vap. | 20 | 0.4 | | (I) | (57) |
| | $CO_2$ | 25.3 | | −1.0 | (I) | (57) |
| | $CO_2$ | 15 | −1.3 | | (III) | (11) |
| | $N_2O$ | 25.0 | | −0.8 | (I) | (57) |
| $C_6H_6$ | Vap. | 20 | 0.5 | | (I) | (49) |
| | Vap. | 18 | 0.3 | | (I) | (57) |
| | $CO_2$ | 25.1 | | −1.0 | (I) | (57) |
| | $CO_2$ | 17 | −1.8 | | (III) | (11) |
| | $H_2S$ | 15.3 | | −1.2 | (I) | (57) |

For other values of $\gamma$ (air) $-\gamma$ (vap.), *v.* A-B-Table and C-Table¶

*Total pressure is one atm. except when only vapor of the liquid is present

VARIATION WITH PRESSURE OF THE GAS; *ca.* 21°C (I) ‖ (29)

| $p_{atm.}$ | $\gamma$ | $p_{atm.}$ | $\gamma$ |
|---|---|---|---|
| $CS_2$-Air | | $C_2H_5OH$-$H_2$ | |
| 1 | 32.2 | 51 | 20.1 |
| 49 | 28.8 | 155 | 18.0 |
| 56 | 22.3 | $(C_2H_5)_2O$-Air | |
| $CHCl_3$-Air | | 1 | 16.9 |
| 1 | 1 | 32 | 14.1 |
| 51 | 0.830 | 141 | 8.3 |
| 150 | 0.608 | $(C_2H_5)_2O$-$H_2$ | |
| $C_2H_5OH$-Air | | 1 | 17.0 |
| 1 | 22.2 | 51 | 15.7 |
| 24 | 20.6 | 152 | 13.4 |
| 212 | 12.1 | $(C_2H_5)_2O$-$CO_2$ | |
| $C_2H_5OH$-$H_2$ | | 1 | 16.1 |
| 1 | 21.3 | 24 | 11.0 |

## NOTES

† These data are not to be used for the calculation of $\frac{d\gamma}{dt}$, or any of its derived functions such as the Eötvös constant, $k_E$.

‡ Prepared from levo-rotatory *sec.*-butyl carbinol.

§ No basis for estimation of error. Author considers error to be 0.5 % of largest value.

‖ The density at pressure, $P$, assumed equal to that at one atmosphere.

¶ For *m*-xylene, *m*-cresol, propionitrile, butyronitrile and aniline, Renard and Guye (69) found that $\gamma$ (air) $= \gamma$ (vapor) ±1 %.

** The same apparatus yields for *dl*-methyl hexyl carbinol: $\gamma_{16°} = 26.7$ and $\gamma_{80°} = 20.76$. It is probable that all of the results are 3 or 4 % low due to faulty calibration.

†† There is no basis for the estimation of errors.

‡‡ There is no basis for the estimation of errors. It is probable however that due to faulty calibration results are about 3 or 4 % low.

§§ This work may be more accurate than is indicated. The precision is high (±0.2 dyne/cm), but as far as can be determined from the data of other observers the surface-tension values are frequently about 0.5 to 1.0 dyne/cm too high. The disagreement may be due to impurities in one of the two samples compared in each case, or it may be due to errors inherent in the present form of the bubble-pressure method.

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(For a key to the periodicals see end of volume)


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# PROPERTIES OF THIN FILMS AND SURFACE LAYERS

N. K. ADAM

### Films of Metals on Glass

Films deposited by cathode sputtering, condensation from metallic vapor *in vacuo*, or by chemical deposition from solution, vary in properties with the method of deposition, age of the film, heat treatment, surrounding atmosphere, and with any conditions which affect the size and closeness of packing of the metallic aggregates of which these films appear to be composed.

Films of nickel are almost amorphous when deposited but a crystalline structure is developed on annealing. The magnetic properties are found only with the crystalline films (28).

The *electrical conductivity* is always smaller than in bulk metals, when films are less than 2000 Å thick; it is usually from one-half to one-fifth of the bulk conductivity; it decreases gradually with decreasing thickness until a critical thickness is reached, when it falls to practically zero.

VOLUME CONDUCTIVITY, $\kappa$, OF A TYPICAL SPUTTERED FILM (Pt) OF THICKNESS, $l$ (50); *cf.* (20)

| $l$, Å | 12 | 26 | 72 | 238 | 600 | 1320 | 2450 |
|---|---|---|---|---|---|---|---|
| $\kappa$, $ohm^{-1}$-$cm^{-1}$ | 20 | 1460 | 2330 | 2260 | 2480 | 2420 | 2560 |

APPROXIMATE AVERAGE CRITICAL THICKNESS

| Metal | Pt | Pd | Au | Cu | Ag | W |
|---|---|---|---|---|---|---|
| $l_c$, Å | 70 | 100 | 120 | 90 | 300 | 100 |
| Lit. | (40, 42, 50, 58) | (42) | (42) | (50) | (42, 58) | (58) |

The temperature coefficient of electrical resistance varies greatly with the structure of the films. It is always less than that of metals in bulk, and may be negative (14, 32, 37, 40).

The *optical properties* of metal films vary with the state of aggregation of the particles in the film, with the purity of the metal, and with other factors. There is a rapid change in the

values of the coefficient of absorption and refractive index, at about the same thickness at which the rapid fall of electrical conductivity occurs (19, 35, 39, 42).

*Thermoelectric properties* (27).

*Change of resistance in magnetic field* (14, 40).

*Photo-resistance effect* (9).

### Surface Layers on Mercury

Approx. thickness, $l$, determined optically

| Layer | Air | Oil | |
|---|---|---|---|
| $l$, Å | 16 (23) | 17.4 to 27.6 (43) | 10.7 to 22 (43) | <50 (18) |

The surface tension, $\gamma$, of mercury when measured in a vapor of pressure, $p$, becomes nearly constant when the area, $A$, per adsorbed molecule (as computed from the Gibbs equation $A = -RT\left(\frac{\partial \log_e p}{\partial \gamma}\right)_{S,T}$) has decreased to *ca.* 27 Å² in the case of methyl acetate and to *ca.* 21 Å² in the case of benzene (29).

### Films of Insoluble Fatty Substances on Aqueous Solutions

The films are one molecule thick, with the polar end of the molecule anchored to the water (1, 34). They exist in the condensed form (*i.e.*, molecules in contact) at low temperatures. Measurement of the areas of films containing a known number of molecules under different conditions give the area of cross-section of various atomic groupings within the molecules, as packed in the films, within *ca.* 3 %.

Condensed Films, Sections of Organic Groups

| Substance and group measured | Maximum section, Å² | Lit. |
|---|---|---|
| Var., hydrocarbon chain, $-C_nH_{2n+1}$* | 20.4 | (2, 6) |
| Amides: $-CONH_2$ | <21 | (2, 5) |
| Esters of long chain acids: $-CH_2CH_2-CO_2R$† | 22 | (2, 5, 6) |
| Acetates of long chain alcohols: $-CH_2-CO_2CH_3$ | 23 | (6) |
| Alcohols: $-CH_2CH_2OH$ | 21.6 | (2, 6, 34) |
| Saturated acids: $-CH_2CH_2CO_2H$ | 20.4 or 25.1‡ | (1, 2, 6, 34) |
| Isooleic acid: $-CH=CHCO_2H$ | 20.4 or 28.7‡ | (2) |
| Ethyl isooleate: $-CH=CHCO_2C_2H_5$ | 28.7 | (5) |
| Benzene ring ⊥ to surface: $-C_6H_4-(OH)$, $(NH_2)$ or $(OCH_3)$ | 23.8 | (4) |
| Acetanilide: $-C_6H_4-NHCOCH_3$ | 28.2 or 25.8§ | (4) |
| Acetamides: $-CH_2NHCOCH_3$ | 20.4 or 24.2§ | (6) |
| Urea derivatives: $-NHCONH_2$ | 20.4 or 25.5§ | (2, 5, 6) |
| Triglycerides | 63 | (2, 34) |
| Pentaerythritol tetrapalmitate | 100 | (6) |
| Glycol dipalmitate | 42 | (2) |
| Cholesterol | 39 | (36) |
| Hydrolecithin | 53 | (36) |

* $n > 13$. † R is $CH_3$, $C_2H_5$, or $C_3H_5$.

‡ Two packings depending on acidity of solution.

§ Two packings stable above and below a transition temp.

### Transition Temperatures between Two Forms of Condensed Film (2, 4, 5, 6)

Compressibility of a film of stearic acid in condition of close packed chains is *ca.* 0.5 % for an increase in compression of 10 dyne/cm. Calculated on the thickness, this is approximately the same as for the substance in bulk (2).

### Expanded Films

Rise of temperature causes a sudden increase in area, at temperature $\theta$ (about 10°C is generally required for completion of the change). The close packed, vertically oriented structure is destroyed. Expanded films are analogous either to liquids, tending (when one chain only is present in the molecules) to 48 Å² per molecule at no compression, or to gases under high compression. Both forms have much greater compressibility than condensed films. $\theta$, the temperature of half expansion under 1.4 dyne/cm compression, increases by about 10° near 0° and about 7° near 60°C, on adding one carbon atom to the hydrocarbon chain. (The increase in $\theta$ is less than this if several chains are present.) $\theta$ also depends on the nature of the end group of the molecule and on the substances dissolved in the water. $\theta$ is raised slightly by compressing the film.

| Substance | C atoms in chain | Surface | $\theta$, °C at 1.4 dyne/cm | State* | Lit. |
|---|---|---|---|---|---|
| Lauric acid | 12 | dil. HCl | <0 | l | (3, 8) |
| Tridecylic acid | 13 | dil. HCl | <0 | l | (3, 8) |
| Myristic acid | 14 | dil. HCl | 9 | l | (3, 8) |
| Palmitic acid | 16 | dil. HCl | 28.5 | | (3, 8) |
| Stearic acid | 18 | dil. HCl | 46 | | (3) |
| Eicosoic acid | 20 | dil. HCl | 57.5 | | (6) |
| Behenic acid | 22 | dil. HCl | 72.5 | | (3) |
| Methyl palmitate | 16 | $H_2O$ | 27.5 | $g_i$ | (3) |
| Ethyl palmitate | 16 | $H_2O$ | 13 | $g_i$ | (3, 8) |
| Hexadecyl alcohol | 16 | $H_2O$ | 46 | | (6) |
| Palmitonitrile | 16 | $H_2O$ | 6.5 | l | (5) |
| α-Bromopalmitic acid | 16 | dil. HCl | 3 | l | (5) |
| Hexadecylphenol | 16 | $H_2O$ | 55 | | (4) |
| Palmitic amide | 16 | $H_2O$ | 36 | | (5) |
| Palmitic aldoxime | 16 | $H_2O$ | 33.5 | | (5) |
| Hexadecylurea | 16 | $H_2O$ | 48.5 | | (5) |

* State of expanded film, l = liquid, $g_i$ = imperfect gas.

### Evaporation in Two Dimensions, "Gaseous" Films

At very low "pressures," expansion to a "vapor state" occurs. Above areas of 5000 Å², the "pressure" obeys approximately the equation, $FA = 1.372T$ ($F$ = "surface pressure," $A$, area per molecule in Å²).

Between 5000 and 100 Å² the films behave either as "imperfect gases" or as "vapors" in contact with "liquid." There is a critical temperature for each substance below which there is a constant two-dimensional "vapor pressure," $F_c$ (7).

"Surface Vapor Pressures" at 15°C

| On dilute HCl | | On water | |
|---|---|---|---|
| Substance | $F_c$ dyne/cm ± *ca.* 0.02 | Substance | $F_c$ dyne/cm ± *ca.* 0.02 |
| Tridecylic acid | 0.30 | Palmitonitrile | 0.15 |
| Myristic acid | 0.19 | Margaronitrile | 0.105 |
| Pentadecylic acid | 0.11 | Stearonitrile | 0.035 |
| Palmitic acid | 0.04 | Tetradecyl alcohol | 0.12 |
| | | Hexadecyl alcohol | 0.015 |

### Films Adsorbed at the Surface of Aqueous Solutions

These are usually one molecule thick (34). The Gibbs equation may be written $\frac{\partial \log_e a_2}{\partial F} = \frac{A}{1.372T}$, where $A$ is the area (in Å²) which contains one adsorbed molecule, $a_2$ the activity of the solute (= its mole fraction in the case of ideal solutions), and $F$, the difference between the actual surface tension of the solution and that which it would have if adsorption could be prevented, usually taken as the surface tension of the pure solvent.

For the following substances, up to 5 dyne/cm, $F$ obeys the equation $FA = 1.372T$ within 10 % (phenol within 25 %). From 10 to 30 dyne/cm, $FA = FB + 1.372T$ k, $B$ being approximately the area filled by the molecules and k a constant for each substance, which is greater the less the cohesion between the adsorbed molecules.

| Substance | Interface | $B$, Å² per molecule | k | Lit. |
|---|---|---|---|---|
| Phenol | $H_2O$ or salt soln.-air | (19) | 0.57 | (22) |
| *n*-Butyric acid | $H_2O$-air | 24.3 | .73 | (49, 50.5) |
| *n*-Valeric acid | $H_2O$-air | 24.3 | .63 | (49, 50.5) |
| *n*-Caproic acid | $H_2O$-air | 24.3 | .43 | (49, 50.5) |
| *n*-Capric acid | $H_2O$-air | 24–25 | .35 | (49, 50.5) |
| Isoamyl alcohol | $H_2O$-air | 22.4 | .59 | (49, 50.5) |
| *tert.*-Butyl alcohol | $H_2O$-Hg | 24.0 | .52 | (49, 50.5) |
| Sucrose | $H_2O$-Hg | 72.7 | 1.00 | (49, 50.5) |

Films of water adsorbed at the surface of salt solutions, where the salt raises the surface tension of the solvent are discussed in (21, 24).

Equilibrium data for fatty substances in bulk, in contact with films are given in (13).

### Soap Films

The stable condition of laminae of sodium or potassium oleate solutions, with or without added glycerol or fluorescent dyes, is a stratified condition, the film being built up of superposed unit layers each of a thickness 50 ± 10 Å (30, 41, 59). The thinnest and most stable "black" soap film consists of one layer of this thickness, with excess liquid collected in droplets locally.

The electrical conductivity of soap solutions containing a small percentage of glycerol and potassium nitrate is the same as that of the liquid in bulk down to 120 Å thickness (44). In the absence of glycerol and potassium nitrate, the electrical conductivity increases at thicknesses $<ca.$ 3000 Å and at 120 Å may be 4 to 8 times that of the liquid in bulk.

The surface tension of stable soap films is unchanged down to 120 Å thickness.

### Miscellaneous

Thickness of the film of contamination required to affect the power of a surface to be wetted by water is approximately 10 Å (15).

Thickness of the vitreous layer produced on a calcite surface by polishing is 5 000–10 000 Å (12).

The minimum thickness of coherent celluloid films as determined optically is 10 to 15 Å (10); but the weight of thin celluloid films is much greater than corresponds to their "thickness" determined optically (33).

Rate of formation of tarnish films on metallic surfaces (54, 55).

Rate of combination of halogens with silver films (25).

Rate of passage of gas through collodion and soap films (16, 17).

The thickness of the film of Pt on a lead cathode which appreciably hinders electrolytic reduction is about 2 Å (53).

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(For a key to the periodicals see end of volume)


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356. Journal of the Royal Society of Arts.
362. Chemické Listy pro vedu a prumysl.
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445. Zeitschrift des Vereins der deutschen Zucker-Industrie. (*Before 1898 was* Zeitschrift des Vereins für die Rubenzuckerindustrie.)
451. Memoirs of the College of Engineering, Kyoto Imperial University. *See* No. 429.
453. Proceedings of the Iowa Academy of Science.
455. Journal of the Chemical, Metallurgical and Mining Society of South Africa.
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469. Bulletin of the Institute of Physical and Chemical Research, Tokyo.
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B51. Seidell, Solubilities of Inorganic and Organic Substances New York, Van Nostrand, 1919.
B56. Onnes, Festschrift, Leiden, 1922.
B57. Tammann, Krystallizieren und Schmelzen. Leipzig, Barth, 1903.
B80. Mulder, Bijdragentol de geschiedenis van het scheikundig gebonden water. Rotterdam, 1864.

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## Key Numbers of Elements

| Ag | Al | As | Au | B | Ba | Be | Bi | Br | C | Ca | Cb | Cd | Ce | Cl | Co | Cr | Cs | Cu | Dy | Er | Eu | F | Fe | Ga | Gd | Ge | Gl | H | Hf | Hg | Ho | I | In | Ir | K | La | Li | Lu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | 55 | 13 | 33 | 54 | 79 | 75 | 15 | 5 | 16 | 77 | 51 | 29 | 59 | 4 | 44 | 4[illegible] | 85 | 31 | 67 | 69 | 64 | 3 | 43 | 25 | 65 | 20 | 75 | 2 | 73 | 30 | 68 | 6 | 26 | 36 | 83 | 58 | 81 | 72 |

| Mg | Mn | Mo | N | Na | Nb | Nd | Ni | O | Os | P | Pb | Pd | Pr | Pt | Ra | Rb | Rh | Ru | S | Sa | Sb | Sc | Se | Si | Sn | Sr | Ta | Tb | Te | Th | Ti | Tl | Tm | U | V | W | Y | Yb | Zn | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 76 | 42 | 47 | 11 | 82 | 51 | 61 | 45 | 1 | 35 | 12 | 23 | 41 | 60 | 37 | 80 | 84 | 40 | 39 | 8 | 63 | 14 | 56 | 9 | 18 | 22 | 78 | 52 | 66 | 10 | 24 | 19 | 27 | 70 | 49 | 50 | 48 | 57 | 71 | 28 | 21 |

# ERRATA

## VOLUME I

PAGE

184 No. 481. *For* $CH_3.CH{:}NOH$ *read* $(CH_3)_2C{:}NOH$.

185 No. 569. *For* Furfural *read* Furfurane.

201 No. 1575. *For* $(CH_2CHOHCO)_2$ *read* $(CH_3CHOHCO)_2O$.

236 Nos. 3727, 3728, 3728.1. *For o-, m-, p-*$CH_3(CH_2)_2C_6H_4CH_3$ *read o-, m-, p-*$(CH_3)_2CHC_6H_4CH_3$, respectively.

298 Neurine perchlorate, 1104. *Delete item.*

PAGE

375 GERMANY. Hessen and Adjoining Regions, Lit. Colum.. *For* (41) *read* (42). (Occurs twice).

376 JAPAN. Second line from bottom. *For* Mikko-Yumoto *read* Nikko-Yumoto.

377 **N. Naëgite.** *For* [Japan] (42) *read* [Japan] (41).

381 Japan. Lit. Column. *For* (42) *read* (41).

381 (41) Ishizu, *After "The Mineral Springs of Japan" insert* Imp. Hygieni. Lab., Tokyo.

# ERRATA

## VOLUME II

PAGE

86 ELECTRICAL RESISTIVITY. Zirconia. *For* $12 \times 10^7$ *read* $1.2 \times 10^3$.

130 Second equation. *For* 0.08 *read* 0.08*A*.

131 TABLE *B*. First Column, eighth line from bottom. *For* Japan, Chihuko *read* Japan, Chikuho.

PAGE

235 **CORDAGE FIBERS.** *After* RELATIVE STRENGTHS *insert* OF TWISTED THREAD OR ROPE.

236 PHYSICAL PROPERTIES. Third column. *After* Breaking strain per strand, *for* g *read* gr.

# ERRATA

## VOLUME III

PAGE

11 *Above* **$NH_3$, Ammonia** *insert* **NO,** Nitric oxide, *v.* p. 14.

43 FIG. 1. *Add* (2.5) Andrews, 5, **40**: 544; 86 *and* (43.5) Sawyer, *Proc. Maine Soc. Civil Eng.*, **1**: 27; 11.

79 **NaOH** at 30°C, 22% solution. *For* 1.2454 *read* 1.2354.

164 *No.* 570. *For* $^t_4$ = *read* $d^t_4$ =

PAGE

205 Column I. *Interchange symbols* W *and* Tl.

259 $H_2S$. Second, fourth, and sixth columns. *For* $10^{-6} \times K$ read $10^{-4} \times K$.

264 $N_2O_4$. Column 3. *For* 78.5 *read* 87. Column 4. *For* 0.016 *read* 0.017.

311 $N_2O_4$ B = $HNO_3$. *For* 78.5 *read* 87.

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